federal register

Thursday
May 10, 1979

Part II

Environmental Protection Agency

Ambient Air Quality Monitoring, Data Reporting, and Surveillance Provisions

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 51, 52, 53 and 58

Air Programs; Ambient Air Quality Monitoring, Data Reporting, and Surveillance Provisions

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rulemaking.

SUMMARY: This final rulemaking sets forth ambient air quality monitoring and data reporting regulations which were proposed on August 7, 1978 (43 FR 34892). This action revokes the requirements for air quality monitoring in Part 51 and establishes a new Part 58 entitled Ambient Air Quality Surveillance. These regulations satisfy the requirements of Section 110(a)(2)(C) of the Clean Air Act (Act) by requiring ambient air quality monitoring and data reporting for purposes of State Implementation Plans (SIP). Criteria to be followed when measuring air quality and provisions for daily air pollution index reporting are established in Part 58 as required by Section 319 of the Act. Part 58 also contains requirements for reporting to EPA certain data related to air pollution episodes so that the information can be included in EPA's annual report to Congress as required by Section 313, Additional Reports to Congress, of the Act. Requirements for public notification of information related to air quality standards violations are included in Part 51 in order to meet the requirements of Section 127, Public Notification, of the Act.

DATES: These regulations take effect upon promulgation.

FOR FURTHER INFORMATION CONTACT: William M. Cox, Monitoring and Data Analysis Division (MD–14), Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, N.C. 27711, phone: Commercial—(919) 541–5312; FTS—629–5312.

SUPPLEMENTARY INFORMATION

Background

The preamble to the August 7, 1978, **Federal Register** proposal notice explained EPA's concern with the quality, completeness, and timeliness of air quality data collected at the State or local level. The monitoring regulations proposed at that time were designed to eliminate the problems associated with data currently being submitted. The regulations being promulgated today are, with the exception of changes made due to public comment, the same as those proposed. The changes made and the substantive comments received are summarized under the appropriate headings below.

History

In October 1975, the Standing Air Monitoring Work Group (SAMWG) was formed at the request of the Deputy Administrator of EPA. The request was made in response to recognition of deficiencies which existed in air quality monitoring and data reporting programs of State and local agencies. The purpose of SAMWG was to identify deficiencies and develop a program for correcting them. Accordingly, SAMWG was composed of representatives from EPA headquarters offices, EPA Regional Offices, and State and local air pollution control agencies.

In June 1977, the strategy document containing SAMWG's analysis and recommendations was published as: "Air Monitoring Strategy for State Implementation Plans," EPA–450/2–77–010, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711, June 1977. Basically the recommendations called for optimization of monitoring networks and better controls on data collection and handling.

On August 7, 1977, the Clean Air Act was amended; one of the amendments being the addition of § 319 to the Act. This Section requires EPA to establish monitoring criteria to be followed uniformly across the nation. It also requires major urban areas to report a uniform daily index and provides that there be a national monitoring network to supplement but not duplicate monitoring for SIP purposes.

The recommendations of SAMWG and the § 319 requirements to a large extent overlap, especially in their intent, i.e., higher quality air monitoring data. The regulations proposed on August 7, 1978, therefore, addressed both SAMWG and § 319. EPA believes that the regulations being promulgated today will provide air monitoring data of acceptable quality; comparable data from all monitoring stations; optimum, cost-effective monitoring networks; and timely data submission for national assessment purposes.

General Discussion

It is apparent from reviewing the public comments on the proposal that some confusion exists with respect to the regulations. Several commenters misunderstood the concept of the monitoring network and the data reporting requirements as set forth in the regulations. It is therefore appropriate at this time to provide another explanation of the concept. EPA is revoking § 51.17 (40 CFR Part 51) which previously required SIPs to provide for monitoring air quality and is promulgating Part 58 which contains new SIP monitoring requirements. Under the new regulations a State will establish a network of monitoring stations to monitor pollutants for which National Ambient Air Quality Standards (NAAQS) have been established. This new network will actually be the existing network with appropriate modifications to conform to criteria contained in Part 58. The network will be designed such that stations are located in all areas where the State and the EPA Regional Office decide that monitoring is necessary. The stations in the network will be termed State and Local Air Monitoring Stations (SLAMS). The regulations do not specify how large the SLAMS network must be. The number and locations of the SLAMS will be jointly determined by the State and Regional Office as data needs dictate. The SIP will contain provisions for establishing and operating the SLAMS network. The data from the network will be condensed and reported annually to EPA in a summary report. The data from which the report is generated will be available to EPA upon request if more detailed data are required for some purpose. States may, however, wish to store the data in the EPA National Air Data Bank (NADB) if facilities are not available otherwise. Using the NADB for full data storage will not relieve the State of the responsibility of seeing that a summary report is submitted each year.

It is anticipated that in most instances the new SLAMS network will be smaller than existing networks. Certain stations that are in areas with air quality consistently better than the NAAQS are, in general, unnecessary. Such stations can be eliminated. The majority of stations that will be eliminated from existing networks in order to form the SLAMS network will likely be high-volume (Hi-vol) samplers for particulate matter and SO_2 bubblers. The stations remaining in operation, relocated stations, or new stations will then all be termed SLAMS and make up the SLAMS network for purposes of the SIP. If the State wishes to continue to operate any station or establish a new station which is not a SLAMS, it may do so. The station will not be considered a SLAMS and will not be subject to any requirements including data reporting. These additional stations will be termed Special Purpose Monitoring (SPM) stations. If, however, the State wishes to

use data from an SPM station as support for a SIP revision or control strategy demonstration, then the requirements applicable to SLAMS, other than reporting, must be met in order that the data be of acceptable quality and comparability. The SPM stations could be used, among other things, to do special research studies, to monitor around a point source for a short period, to determine if a specific area may need a permanent SLAMS, or to monitor for pollutants for which NAAQS have not been established.

Stations used to determine the impact of a source for purposes of Prevention of Significant Deterioration (PSD) would not be part of the SLAMS network nor would they be considered SPM stations. PSD stations, in general, would be operated only for periods of up to a year and would be operated by the source owner or operator although a SLAMS could also serve as a PSD station. In order that the PSD data be of acceptable quality and comparable to SLAMS data, quality assurance requirements for PSD stations are included in Part 58.

The fourth type of station covered by the regulations is the National Air Monitoring Station (NAMS). The regulations do not require establishing a separate network of NAMS. The NAMS will be stations selected from the SLAMS network. These stations will also continue to be SLAMS and will be subject to all SLAMS requirements, including the annual summary report. The only distinguishing characteristics of NAMS will be:

1. Only continuous instruments will be used to monitor gaseous pollutants.

2. The regulations specify a minimum number of NAMS and locations for them.

3. Data from NAMS, in addition to being included in the annual SLAMS summary report, will be reported quarterly to EPA.

The NAMS concept is being established in order to provide timely data to EPA from a national network for national data analysis. The amount of data that will be reported quarterly to EPA will be considerably less than that required in 40 CFR 51.7, Reports, which is being revoked. The concept of the NAMS addresses the requirements of § 319 of the Act to establish a national network. It is inconceivable that monitoring would be required in any area for national analysis but not for SIP purposes. Any area where a NAMS is needed, therefore, would be an area which should be covered by a SLAMS. In order to avoid duplication of effort, the NAMS will simply be a subset of the SLAMS instead of a separate network measuring air quality in areas already being measured by SLAMS.

A most important point to understand is that, while there are minimum numbers of NAMS that must be established, these minimum numbers are not a minimum for the SLAMS network. There is no minimum or maximum size for the SLAMS network. The size of the SLAMS network is to be determined based on characteristics of any one area or State such as meteorology, geography, population, and emission density. The NAMS will typically be those SLAMS which represent locations such as those having high pollutant concentrations, high population exposure, or a combination of both. The NAMS are being established only for the purpose of providing EPA with timely data from the more important stations across the nation. EPA does not believe that the small number of NAMS will be adequate to meet all of the SIP monitoring objectives. It is anticipated that the number of NAMS will only be from 10% to 40% of the total number of SLAMS.

The final point to be made with respect to this subject is that EPA's use of air quality data will not be limited to NAMS. Important judgments or decisions will be based on all data available which will include SLAMS data.

In summary, there will be only one monitoring network; the SLAMS network. Any additional monitoring the State wishes to do will be SPM monitoring subject to no requirements unless used for SIP purposes. Source owners or operators will operate PSD stations, from which the data will be periodically reported to the permit granting authority. A certain number of select stations from the SLAMS network will also be termed NAMS, the data from which will be subject to an additional reporting requirement.

Reorganization of Part 51

In an effort to make Part 51 more readable and understandable, EPA is reorganizing and expanding the format of the regulations. The restructured regulations will contain numerous subparts containing material formerly organized as sections. More headings will be used and the reader will be able to more readily find appropriate requirements. Regulations being promulgated today in Subparts J, O, and Q of Part 51 are in the new format. Subsequent to this promulgation, other sections of Part 51 will be rewritten and reorganized utilizing the new format.

Ambient Monitoring for Lead

The preamble to the proposal of these monitoring regulations on August 7, 1978, stated that the regulations requiring ambient lead monitoring (43 FR 46264) would be incorporated into Part 58 in this promulgation. Those lead monitoring regulations which were promulgated October 5, 1978, in § 51.17(b) of Part 51 required the plan to provide for establishing lead monitoring stations; specified an operation schedule of one 24-hour sample every six days; required that a description of the monitoring system be available; specified a two-year time limit on station establishment; and reference a guideline, *Supplementary Guideline for Lead Implementation Plans,* which contained additional information on monitor siting. The lead monitoring regulations were promulgated simulataneously with the lead NAAQS.

At the time of promulgation of the lead regulations, quality assuranace criteria had not been developed for lead. Rather than incorporate the § 51.17(b) regulations alone into Part 58 in today's promulgation, EPA will propose and promulgate in Part 58 all the lead regulations in one action which will include the § 51.17(b) monitoring regulations, the siting criteria from the lead guideline, and quality assurance criteria for lead which is under development.

Accompanying the October 5, 1978, promulgation of the lead regulations and lead NAAQS was an Advance Notice of Proposed Rulemaking (ANPR) concerning ambient lead monitoring around primary and secondary lead smelters and primary copper smelters. The notice indicated that EPA was considering regulations to require such point source monitoring in order to determine if the sources were causing violations of the lead NAAQS and whether additional or alternative control strategies would therefore be necessary. The notice also indicated that a guideline would be developed covering the number of necessary monitoring stations and siting parameters for monitoring around point sources. Two quidelines have been prepared—one for short-term monitoring to obtain ambient lead air quality data essential for the development of a lead control strategy *(Guideline for Short-Term Lead Monitoring in the Vicinity of Point Sources);* the other for longer term monitoring in order to determine if point sources will cause NAAQS violations after the attainment date and to estimate the contribution of fugitive emissions to such violations *(Guideline*

for Lead Monitoring in the Vicinity of Point Sources).

EPA has reevaluated the need for specific regulations for lead monitoring around point sources and concludes that monitoring point sources to determine NAAQS violations is an objective of the SLAMS network. In designing a lead SLAMS network, the States and Regional Offices should follow the long-term guideline *(Guideline for Lead Monitoring in the Vicinity of Point Sources)* in order to assure that emissions from the point sources are adequately monitored. An alternative would be for the State to require the point source to conduct the monitoring and report the date to the State. The data could then be used for control strategy purposes provided they were collected in accordance with the long-term point source guideline.

Until such time as the lead monitoring regulations, siting criteria, and quality assurance requirements are incorporated into Part 58, States would be expected to follow the siting and quality assurance criteria in the long-term point source monitoring guideline.

Public Comments

The object of **Federal Register** proposals is to allow comments on new regulations prior to their promulgation thereby providing an opportunity for the public to participate in rulemaking. The bulk of the regulations proposed August 7, 1978, were new regulations; however, some of the regulatory material was simply being recodified. The content or meaning of the recodified regulations was not changed; the requirements were simply restructured and placed in new sections or appendices. Eventually all of 40 CFR Part 51 will be restructured in an effort to make Part 51 more readable and easier to use. The recodification taking place in these regulations is one of the first steps toward the Part 51 restructuring.

Even though the proposal preamble specified which regulations were not being changed, other than being restructured, EPA received public comments on some of those unchanged regulations. The comments on the unchanged regulations will be noted in this preamble but EPA will not entertain suggestions for changing these regulations at this time since the object of the proposal was not to repropose the regulatory content. The comments may be used in the future to determine the need for reproposing and updating the regulations.

EPA received forty-six written comment letters on the proposal of August 7, 1978. The origin of the letters is as follows:

Federal Agencies	1
Private Citizens	1
Industry	15
State Air Pollution Control Agencies	16
Local Air Pollution Control Agencies	13
Total	46

The following discussion covers the substantive public comments from the letters and any oral comments received. The discussion is organized by subject matter. No public comments were received on certain portions of the proposed regulations; therefore, no discussion of those portions of the regulations appears in this preamble. For example, no comments were received on the regulations proposed in response to § 127, Public Notification, and § 313, Additional Reports to Congress, of the Act. This preamble primarily discusses only the public comments. Detailed discussion of the regulations can be found in the preamble to the August 7, 1978, proposal.

The full text of the letters and summaries of individual comments together with the action taken by EPA and justification for that action will be available for public inspection during normal business hours at the Public Information Reference Unit, 401 M Street, S.W., Washington, D.C. 20460.

General Comments

The comments discussed under this heading were not specific to any regulation or appendix but were general comments or were comments on some aspect of the monitoring program covered by the regulations.

One commenter requested a public hearing and an economic impact statement on § 51.24(n)(3) which requires quality assurance procedures be applied to PSD monitoring. The reasoning given for the request was based on the impact of the PSD program. These regulations are not concerned with the PSD program except to apply quality assurance requirements to PSD monitoring. The impact of just the PSD quality assurance requirements falls far short of a level that would require an economic impact statement. This comment would have been appropriately made in response to the PSD regulations which were proposed in the **Federal Register** on November 3, 1977 (42 FR 57471).

One commenter felt that EPA should store and distribute air quality data collected at PSD stations because the cost of making it available to the public is prohibitive to the States. EPA suggests that the cost of reproducing and providing data to the public could be recovered by the States through fees for such a service. Handling PSD data at the State level where it is used will be much more cost effective than EPA collecting, storing, and providing the public with data from all over the nation.

Two commenters suggested that EPA should make data from all stations (SLAMS, PSD, SPM) available to the public within 90 days of the end of each quarter. Experience with obtaining air quality data shows this to be an unworkable suggestion. One of the main purposes of the NAMS concept is to mitigate data reporting problems by striving to get just a portion of the data from the SLAMS network to EPA within 90 days. The resources it would take to get all data in within 90 days could not be justified. Also, the historical usage of data from the NADB indicates no need for availability of all SLAMS data within 90 days. Concerning SPM data, the definition of SPM stations provides that the data are primarily for the State's use. Data storage for PSD stations was discussed above.

Two commenters stated that there should be only one type of station and that all data should be used for national assessment. The reasons for the types of stations were discussed under the heading "General Discussion" above. The discussion also pointed out that all SLAMS data will be used by EPA in the course of making important decisions or assessments.

One commenter stipulated that special purpose monitoring should be used for such things as particle sizing, or background. SPM stations may be used for such purposes but EPA, because of the definition of SPM stations, will not set forth such a requirement. The factor most affecting the degree to which a State carries out special purpose monitoring is the availability of resources. EPA does not wish to interfere with the allocation of any monitoring resources available to a State above those resources needed to implement the regulations being promulgated today.

One commenter emphasized the need to analyze air quality data on the basis of geographical distinctions. EPA and the States take into account geographical, meteorological, and other characteristics of monitoring sites when evaluating ambient air quality data.

One commenter suggested that State air quality monitoring networks include stations in remote locations to determine background or general pollution levels. EPA feels that sufficient monitoring to determine background is

already underway and will remain so through monitoring stations operated by EPA, States, other federal agencies, PSD sources, etc.

Eight commenters objected to the elimination of certain stations that will occur when networks are trimmed down to form a cost effective SLAMS network. The basis for the objection is that these stations have provided historical data upon which trends can be based. EPA does not feel that resources necessary to continue collecting data of questionable quality can be justified for trends purposes. In some cases the historical data quality is simply not acceptable enough to preserve the site. Even for sites which have provided good quality data, resources would be much better utilized in upgrading the entire network as these new regulations require rather than continuing to operate unnecessary stations. One solution, however, would be for the States to operate SPM stations at the sites in question.

One commenter felt that EPA should delcare valid all data collected prior to today's promulgation if the analyzers meet the requirements of 40 CFR Part 53 pertaining to reference or equivalent methods. EPA cannot make such a blanket declaration because the status of an analyzer at the time of installation is not the only factor which affects data validity. Siting of the instrument and continued proper operation of the analyzer can easily affect data quality. Also, it is not necessary to obtain EPA approval in order to use previously collected data. The preamble to the August 7, 1978, proposal discussed using historical data. To summarize that discussion, the degree to which historical data can be used depends on the intended use of the data and the degree to which various factors have affected the data quality.

One commenter was concerned that the regulations do not apply to local air pollution control agencies. It is true that the regulations are in terms of requirements on States; this reflects the language of the Clean Air Act. The States must see that regulatory requirements are met, but they can be met by a local agency to which the State has delegated certain actions. In such an instance, the State would still have the responsibility to see that requirements are met. The regulations are thereby indirectly binding on local agencies.

Three commenters stated that the material in the appendices to Part 58 should be in guideline form. One of the commenters suggested that the regulations could then require the guidelines to be followed. Such an approach would not meet EPA's intent. Guidelines are for the purpose of indicating ways in which regulatory requirements may be carried out. Guidelines are not necessarily binding and can be deviated from or not followed at all. EPA has published guidelines on monitor siting and quality assurance but the existence of those guidelines did not prevent the current problems with data quality. EPA's intent is to establish binding criteria which will be followed. The appendices have undergone the same review procedures as the regulations and are to be considered as regulations. Also, by putting the material in regulatory form, no changes can be made without proposal for public comment in the Federal Register. Guidelines may be changed without any notice at all. Finally, § 319 of the Act requires that EPA promulgate air quality monitoring criteria to be uniformly used nationwide.

Two commenters felt that certain portions of the regulations should be reproposed. None of the regulations have been substantively changed enough since proposal to warrant reproposal. All significant changes that have been made are due to public comment. Accordingly, no portions will be reproposed.

Two commenters requested a public hearing on the regulations; however, these requests were later withdrawn. Since no other interest was expressed, no public hearing was held.

One commenter asked that EPA describe in the regulation a "scientific method for extrapolating the boundaries of a nonattainment area from a given ambient monitoring site." The commenter contends that there exists an adequate body of scientific knowledge to permit extrapolation of ozone nonattainment areas for many hundreds of miles. EPA disagrees and does not believe that sufficient information is now available to prescribe a scientific method for determining nonattainment boundaries around a single monitoring station.

In a related matter, EPA recently responded (43 FR 6395) to comments submitted by the State of New Jersey which challenged the Agency's policy for designating areas as attainment, nonattainment, or unclassifiable for the ozone standard. New Jersey has argued that sufficient technical evidence is available to require that EPA mandate a nonattainment designation for all areas in the eastern half of the country. In that notice, the Agency determined that the scientific information relied upon by New Jersey is not definitive enough to require that all areas in the eastern portion of the country be designated nonattainment.

The regulations being promulgated today reflect the fact that monitoring stations are representative of only a finite area within the vicinity of a station. Appendix D to Part 58 describes the concept in terms of spatial scale of representativeness which means the physical dimensions of the air parcel nearest a monitoring station throughout which actual pollutant concentrations are reasonably similar. States are being asked to examine their monitoring stations and apply the concepts described in Appendix D to classify each station according to the most appropriate spatial scale of representativeness. Such a determination requires the knowledge and a case-by-case judgment of personnel who manage and operate ambient monitoring networks. Factors to be considered by agencies in making these judgments include: (1) the size and proximity of nearby sources, (2) geographical and topographical features around the station, (3) pollutant formation and transformation processes, (4) placement of the monitoring station relative to buildings, air flow obstructions, street canyons, etc. These factors have a significant impact on spatial concentration patterns and, thus, are important determinants of the size of the area around a monitoring station having reasonably homogeneous air quality.

EPA has one study underway that will attempt to determine the horizontal representativeness of ground level ozone measurements and the suitability of data collected by aircraft as an indicator of ground level ozone air quality. Ozone was chosen for this study since many ozone monitors nationally are showing days exceeding the ozone NAAQS and because of the controversy that exists over the spatial representativeness of a single ozone monitor. The results of this study will not be available for several months but will provide agencies with additional technical information for classifying SLAMS ozone stations and for reevaluating the boundaries of nonattainment areas.

In some situations, special purpose monitoring studies could be initiated by agencies to determine reasonable boundaries for which data from a station (or class of stations) are representative. Such a study might include simultaneous measurements of pollutant levels at varying distances from the station to be classified. These studies are, however, expensive to conduct and may produce results which

are applicable only to the station being evaluated. EPA will continue to provide additional guidance to States for determining the representativeness of stations as scientific data are accumulated and analyzed.

Several commenters asked that EPA specify the minimum number of stations that are needed to define the extent of nonattainment for any given pollutant. As indicated in Appendix D, EPA does not believe that it is practical to prescribe a set of criteria for determining the number of stations that would be applicable for all States. Factors that influence the size of a network and must be considered when designing a network which includes the objective of defining the extent of nonattainment are emission inventories, climatological summaries, and local geographical characteristics. These factors can vary widely from one area to another thus prohibiting the specifications of a minimum number of stations for all States. The optimum size of a particular SLAMS network must be determined on a case-by-case basis.

Two commenters stated that some provision should be made for nonattainment areas that have been designated on the basis of data from improperly sited stations. The basic purpose for the criteria in Appendix E to Part 58 for siting monitors are twofold: (1) to promote uniformity in location of new monitoring stations, and (2) to classify existing stations in terms of the most appropriate spatial scale of representativeness. The emphasis is, thus, on improving the base of monitoring information needed for making informed judgments about air quality. Classification of existing stations according to the most appropriate scale of representativeness will make data more comparable among stations having similar classifications and will also provide an improved basis for determining the geographical scope of nonattainment. In most instances, stations not technically meeting the siting criteria given in Appendix E cannot be excluded for purposes of attainment/nonattainment. These stations are simply measuring air quality over a scale smaller than would be expected if the siting criteria were strickly adhered to. The implication is that the scope of a nonattainment area is linked to the actual spatial scale of representativeness of a monitoring station—the smaller the scale of representativeness at the station, the smaller the geographical extent of nonattainment.

In some cases, existing stations may be producing data not suitable for purposes of nonattainment decisions. On September 11, 1978, a Federal Register notice (43 FR 40412) was published which amended nonattainment area designations as required by section 107 of the Clean Air Act. The preamble to that notice discussed provisions that should be made as a result of TSP monitors not sited in accordance with EPA siting criteria.

The policy stated for TSP in that notice was that only those monitoring sites which are unduly influenced by reentrained road dust can be excluded for establishing the design values for SIP development work and for purposes of nonattainment area designation. As explained in that notice, an evaluation could be conducted to determine if roadway influence is significant enough to warrant disregarding the data from the monitor. A similar rationale could be applied for determining the appropriateness of nonattainment reclassification for other pollutants.

Resources

Several commenters pointed out the need for additional resources in order to meet the requirements of the regulation involving instrumentation, siting, and quality assurance. EPA recognizes that in many instances, additional resources are needed and have been making increased allocations to the States for monitoring through the Section 105 Grants mechanism. For example, in FY–1979, increases over FY–1978 allocations amounted to an average of 500 thousand dollars per EPA Region. This includes a total of 360 new analyzers to be purchased nationally using FY–1979 Grants and State matching funds. Similar increases in allocations are expected for FY–1980 since the total 105 Grant monies available has been increased.

Public Comments—Regulations

The following discussion covers the comments received on specific regulations.

Section 51.322 Sources subject to emissions reporting. One commenter stated that emissions from sources smaller than the cut-off size stipulated in the regulations should be allowed to be reported in the annual emissions report. The regulations only establish the lower size limit for sources which must be included in the report. The regulation does not prevent States from including smaller sources. Smaller sources are currently included in the emissions report and may continue to be.

One commenter felt that the emissions reporting effort was of little value and should be re-evaluated. Historical usage of the emissions data in the NADB indicates ample justification for emissions reporting. The emissions data in the NADB have been and are being used in conjunction with such things as establishing new NAAQS, determining the impact of New Source Performance Standards, establishing energy policies, developing national emissions trends, and formulating volatile organic compound emissions control policies in ozone nonattainment areas.

Section 51.323 Reportable emissions data and information. One commenter pointed out that the Hazardous and Trace Emissions System (HATREMS) had not been released for use. This was true at the time of proposal but the system is now ready to accept emissions data.

Two commenters stated that new emissions data for a source should not be required to be submitted unless the emissions have changed by a specified amount. EPA agrees and has revised the regulations to require reporting of new emissions data only if the emissions have changed by 5% or more since the last time the emissions were reported. The regulation continues to require a yearly update of the year of record of data which did not change. The intent of the revisions to this section is that the data in the NADB always be up-to-date either by having it submitted in the last annual report or by having the year of record of unchanged data updated.

One commenter pointed out that § 319 of the Act did not cover emissions reporting and that the new requirements would create an additional burden on States and emissions sources. It is true § 319 does not deal with emissions reporting, but only a portion of the regulations being promulgated today are in response to § 319. Some of the regulations are in response to SAMWG recommendations. The bulk of the requirements pertaining to emissions reporting, however, are not new but are simply being restructured. The emissions reporting regulations have been in effect since August 3, 1973, and have been in § 51.7 of 40 CFR Part 51. The minor revisions that are being made should actually reduce the burden on resources by changing the semi-annual report to an annual report and extending the period within which it must be submitted.

One commenter indicated that compliance with the Storage and Retrieval of Aerometric Data (SAROAD) format for emissions data would create an additional burden. The requirement

to report emissions is in terms of the National Emissions Data System (NEDS) and not SAROAD. The SAROAD format is for reporting ambient air quality data.

Section 58.1 Definitions. One commenter felt that the definition of "local agency" should include Indian tribes to which the State has delegated authority to carry out a portion of the monitoring program. In response to this comment, definitions of "Indian Reservation" and "Indian Governing Body" have been added to § 58.1. Also, in § 58.3 the applicability of the regulations has been extended to Indian Governing Bodies which have been delegated authority to monitor for SIP purposes.

Section 58.14 Special purpose monitoring. One commenter felt that no SPM activity would be conducted if the data could not be used for SIP purposes. As discussed above, SPM data can be used for SIPs if the criteria applicable to SLAMS are followed. SPM activity is strictly at the discretion of the State for any purpose the State wishes.

Section 58.20 Air quality surveillance: Plan content. One commenter pointed out that this section requires submittal by January 1, 1980, of the SAROAD site Identification (ID) form for each SLAMS, but some of the SLAMS will not be located at that time and no forms will be available for those stations. An appropriate correction has been made to § 58.20 to require that on January 1, 1980, a schedule be submitted which would include a time frame for submission of site ID forms for those stations which were not in existence on January 1, 1980.

Section 58.21 SLAMS network design. One commenter stated that the Regional Offices of EPA should have no control over the design of the SLAMS network. Such a suggestion is contrary to the intent of the regulations. The purpose of EPA participation in network design is to insure that all monitoring necessary for purposes of the SIP is carried out. The reponsibilities of EPA with respect to monitoring are comparable to those responsibilities the Agency has of seeing that SIPs contain the proper control regulations. Accordingly, a statement has been added to § 58.21 that the final SLAMS network design is subject to the approval of the Regional Administrator.

Section 58.23 Monitoring network completion. One commenter suggested that SLAMS in nonattainment areas should be located and meet the monitoring criteria earlier than the January 1, 1983, compliance date established in this section. The completion date of January 1, 1983, applies to the entire SLAMS network. For those stations which will also be designated as NAMS, however, the completion date is January 1, 1981. As previously stated, the NAMS will be certain select stations from the SLAMS network and will represent such areas as those of highest pollutant concentration or high population exposure. EPA feels that through the NAMS mechanism, acceptable data will be available at the earliest date that is economically feasible in most cases. These completion dates for SLAMS and NAMS are only deadlines. If States wish to complete the network at an earlier date, they may do so.

Section 58.24 Interim network. This section was added to the regulations to provide that monitoring continue between today's date (§ 51.17 is being revoked today) and when the new monitoring plan is submitted on or before January 1, 1980. Without this section there would be no requirements for monitoring during that interim period. It has been decided, however, that this requirement is unnecessary since the existing SIPs contain monitoring provisions and those SIPs will not be revoked until the new monitoring plans are submitted. This section is therefore deleted. If any revisions to the existing monitoring plans are submitted, they will be approved only if consistent with the new requirements being promulgated today. SIP revisions which have been submitted and were being acted upon prior to today's date will be judged in light of the former requirements under which they were submitted if the State wishes. The State will, however, be notified of any inconsistencies with these new monitoring regulations.

Section 58.26 Annual SLAMS summary report. One commenter requested that the EPA Regional Office generate the annual SLAMS report. The regulations requiring the annual report place the responsibility for the annual report on the State. How or where the report is produced is at the discretion of the State. In many cases the SLAMS data from which the annual report is generated will be submitted through the Regional Office for storage in the NADB. For those States who have their own storage facilities for their SLAMS data, the Regional Office might not have access to the data and so would not be able to generate the annual report.

One commenter stated that certification of the annual report by the State program director would serve no useful purpose. The regulation has been changed to read "the senior air pollution control officer in the State or his designee." The requirement is being retained because EPA feels that it is the responsibility of the State to certify that data are accurate. Any EPA decisions based on such certified data can then be made with more confidence than would be the case if States were not required to check the accuracy of the annual report.

Section 58.35 NAMS data submittal. One commenter could not find data validation procedures in the AEROS Users Manual and another commenter requested that the validation procedures be published as an appendix and be proposed for comment. At the time of proposal the procedures had not been added to the AEROS manual but this task has now been completed. The regulation has been changed to require that data be edited and validated. The regulation then states that procedures for doing so can be found in the AEROS Users Manual. The manual, therefore, acts as a guideline. EPA does not feel it appropriate to make the editing and validation procedures regulatory. Validation procedures are too broad in scope and new procedures are evolving too rapidly to establish specific procedures. A regulatory approach would hamper innovative validation ideas.

One commenter felt that it should be made clear that the SLAMS annual report does not satisfy the requirements for a NAMS quarterly report. Hopefully, this has been done above under the heading "General Discussion."

Section 58.50 Federal monitoring. One commenter suggested that because of this section federal monitoring may be the only monitoring done in the commenter's State. The language in this section is simply a statement of an action that the Administrator may choose and reflects the language of § 319 of the Act. Section 319 requires federal monitoring to supplement but not duplicate State monitoring carried out for purposes of the SIP. This requirement does not assume that no SIP monitoring will be done.

One commenter stated that any federal monitoring should follow the criteria set forth for the States to follow and another commenter felt that renegotiation with the State should take place before federal stations are established. Any federal monitoring will follow the criteria as established in Part 58. If the possibility of federal monitoring exists, the State will be notified and given the opportunity to operate a station in the specific location under consideration.

Section 58.51 Monitoring other pollutants. One commenter thought that

public comment would severely slow down action on the establishment of criteria for monitoring other pollutants. The regulation, however, only states that the Administrator *may* promulgate such criteria. Such criteria could be established in guideline form.

One commenter felt that such a network should not be limited to urban areas. The reference to urban areas has been removed from this section.

Public Comments—Appendices A and B

Due to the similarity in Appendices A and B, public comments on both appendices will be addressed under the following discussion.

Two commenters suggested that the appendices should allow audits of analyzers to be done with less than five audit points or concentrations per audit. Also, one commenter requested that audit concentrations include higher concentrations such as those encountered during air pollution episodes. Both appendices have been revised to require audits at only three concentration levels for normal monitoring and four concentrations in the case of extended range monitoring for high pollutant concentrations. Accuracy of monitoring data will now be assessed at each audit point rather than using all audit points to calculate a single accuracy value from a regression equation. With this modification, accuracy can be adquately assessed with a reduced number of audit points.

Two commenters stated that the allowable intervals for generating audit concentrations are too small. Both appendices have been revised to allow larger concentration intervals at each audit level. These broadened intervals will still allow accuracy to be assessed adequately and will make generation of audit values easier.

Three commenters felt that the audit rate is too frequent. EPA disagrees and feels that periodic auditing of once per quarter is needed to assess accuracy of data. Auditing less frequently than quarterly would be inadequate for accuracy assessment.

A number of different comments were addressed to the portions of Appendices A and B concerning control of the quality of data through policies and procedures. As a result of considering the public comments, the quality control portions of the appendices have been rewritten. The nature of this change is described below after the following discussion of the public comments.

Seven commenters felt that five upscale points plus zero are more than that required to accurately define a calibration curve. Eight commenters suggested that weekly span checks be performed at a higher range. Four commenters felt that the acceptable limit for span drift is too large. One commenter requested that a zero check be performed. Three commenters stated that when acceptance limits for span checks are exceeded and corrective action is performed, a span check should be performed to determine if a complete recalibration is necessary. Six commenters were concerned that the proposed appendices provided no directions on whether, and how, to adjust analyzers for zero and span drift. One commenter stated that instrument calibration in a laboratory and subsequent transportation to the field is precluded by the wording of the proposed appendices. Five commenters felt that span checks should not be required if the checks will interfere with monitoring during an air pollution episode and one commenter was concerned that no directions are given on invalidation of data as a result of span checks. One commenter suggested allowing zero, span, and calibration gases to be introduced directly into the instrument and not through a manifold.

Consideration of the above comments brought about a reanalysis of the need for the detailed quality control requirements that had been proposed in Appendices A and B. The quality assurance program now required by Appendices A and B is based on two distinct and equally important functions. The first function is quality control which consists of controlling the quality of data through policies and procedures such as calibration practices, zero and span checks and adjustments, preventive maintenance schedules, and training and expertise of operators. The second function is the assessment of the data quality in terms of their precision and accuracy. For the sake of national uniformity, the assessment function is specified quite explicitly in the appendices. From review of public comments, however, it became apparent that the explicit quality control requirements which were proposed in Appendices A and B were not appropriate due to the nature and complexity of quality control. There are many problems or situations which can better be solved at the State level and which detailed requirements cannot account for. Accordingly, the quality control requirements have been revised and are now specified in general terms. The States are required by Appendix A to develop a detailed quality control program which is acceptable to the Regional Administrator. A State can now design a quality control program which is specific to its situation and which will be approvable as long as it provides for data of acceptable quality.

Two commenters requested a definition of agency with respect to precision and accuracy reports. The concept of a "reporting organization" has been introduced in Appendix A and a definition provided. Precision and accuracy should be reported for groups of monitors having the same laboratory and field support. The concept of a reporting organization provides for such reporting.

One commenter felt that collocated monitors for manual methods should not be fixed but should be permitted to be rotated throughout a State. In order to provide for precision and accuracy analyses for each reporting organization, collocated monitors must be maintained in each area covered by a reporting organization. The requirement for two collocated sites for manual methods in each area covered by a reporting organization will be retained.

One commenter pointed out that many station site configurations will not allow collocated monitors to be three meters apart. A wording change has been made to require collocated monitors to be between two and four meters apart.

Three commenters stated that the "t" statistic should be used in equations five and six of Appendix A and equations four and five of Appendix B rather than the "z" statistic. EPA disagrees and is maintaining the "z" statistic which is appropriate for probability limits.

One commenter requested that EPA emphasize the fact that traceability of calibration and audit gases to the National Bureau of Standards (NBS) standard reference materials (SRM) does not mean using NBS SRM's as the calibration or audit standards per se. Also, one commenter suggested allowing traceability of calibration and audit gases to the same set of NBS SRM's. Language has been added to Appendices A and B to allow for these two suggestions.

One commenter stated that the quality assurance program would cause delays in data submittal due to audits and removal of suspect data. EPA disagrees that delays will occur and maintains that audits are a necessary part of quality assurance.

One commenter felt that a system audit should be required for PSD monitoring. Appendix B has been revised to allow the permit granting authority or EPA to conduct a system audit.

One commenter asked when the requirements of Appendix B take effect. The regulations have been revised to

specify that for new stations, the requirements take effect when the station is established, and for existing stations, the requirements take effect at the discretion of the permit granting authority, but no later than January 1, 1980.

Public Comments—Appendix C

Since Appendix C was proposed on August 7, 1978, portions of Section 2.6 and the entire Section 4 have been rewritten. One purpose of these revisions is to allow analyzers to be used for monitoring during those times when air pollution levels rise above the ranges on which the analyzers have been designated for use as reference or equivalent methods. If higher, undesignated ranges are used, the use of the analyzer would no longer be considered a reference or equivalent method and would not be approved for use in a SLAMS. Provisions in the regulations were needed which indicated that monitoring should continue during periods of high concentrations and stipulated the acceptable ranges for use during those periods. Such provisions have been added to Appendix C in Section 2.6. Section 4 of this appendix addresses the problem of short-term particulate measurements for purposes of tracking air pollution episodes. The reference method for particulate matter, the Hi-vol sampler, is not designed to give real time data. Section 4 describes instruments that may be used for short-term measurements of particulate matter.

As revised, Section 2.6 of Appendix C allows an analyzer to be used on a range higher than that designated for the analyzer if it is an analyzer approved for use as a reference or equivalent method, or on a range higher than the range accepted for use under Section 2.5 of this appendix. Section 2.5 allows an analyzer which has not been designated for use as a reference or equivalent method to be used if it were purchased before February 18, 1975, and if it passes all the performance specifications for reference or equivalent methods except the range requirement found in Table B–1 of 40 CFR Part 53. The range accepted for use must not extend to higher than two times the range limit of Table B–1.

The higher ranges allowed by Section 2.6 are in two categories. The first category is a range less than or equal to two times the Table B–1 limit. The second category is a range more than two times the Table B–1 limit. Use of the higher ranges is limited to areas where and to periods of time when, high concentrations are likely to occur. This restriction will require the use of the most sensitive range capable of measuring any given concentration. The restriction is not meant to cause a continual switching of ranges (unless an instrument does this automatically) when concentrations frequently vary between two ranges. Through a case-by-case determination, certain analyzers may be continually operated at a higher range during seasons and in areas where concentrations occur in that range frequently enough to justify continual operation.

Section 4 requires, for purposes of particulate episode monitoring, use of methods which give real time data such as modified Hi-vol procedures, tape samplers, or any other appropriate device. In order to use methods other than the Hi-vol, however, a quantitative relationship to the Hi-vol (operated under reference method procedures) must be established at the site where the method will be used. It is necessary to establish a site-specific relationship because the relationship between Hi-vols and other methods varies with location. Procedures for establishing a quantitative relationship are contained in "Guidance for Selecting TSP Episode Monitoring Methods," OAQPS No. 1.2–114.

As now written, Appendix C provides that all pollutants for which NAAQS have been established, except lead, should be monitored during periods of high concentrations so that real-time data will be available for tracking air pollution episodes. Such short-term monitoring is not required for lead because episode levels have not been established for that pollutant.

The following discussion covers the substantive public comments received on Appendix C.

One commenter requested an explanation of Section 2.2 which allows SO_2, CO, or O_3 analyzers purchased prior to February 18, 1976, to be used until February 18, 1980, and allows NO_2 analyzers purchased prior to January 3, 1978, to be used until January 3, 1980. This section is only meant to limit the use of non-reference or non-equivalent methods until the two deadline dates. Any instrument designated for use as a reference or equivalent method may be used indefinitely unless the designation is withdrawn.

Four commenters stated that it would be too costly to replace after February 18, 1980, SO_2, CO, O_3 analyzers which have not been approved for use as reference or equivalent methods. This requirement in Section 2.2 is not a new requirement but was promulgated on February 18, 1975, in 40 CFR 51.17a. The requirement was established to allow States adequate time to replace analyzers which could not pass the equivalency requirements or for which equivalency testing would not or could not be done for various reasons.

One commenter suggested that EPA perform equivalency tests on analyzers that the manufacturers were uninterested in testing. Considering the time period that has been allowed for analyzer replacement, the number of analyzers that would have to be tested, the unreasonably costly modifications that would have to be made to some analyzers, and the resource constraints on EPA, such a suggestion cannot be justified.

One commenter felt that the range requirement for reference or equivalent methods should be increased by two. A range up to twice that allowed in Table B–1 of 40 CFR Part 53 is currently permitted under § 53.20(b).

Four commenters indicated that the current reference method for particulate matter measures large particules which do not cause health related effects. One of the commenters suggested a more comprehensive monitoring system that determines size and composition of particles. The existing NAAQS for particulate matter are for total suspended particulates as measured by the existing reference method (the Hi-vol). The regulations being promulgated today do not modify the particulate matter NAAQS nor the reference method. The standard for particulate matter is currently being re-evaluated as required by the Clean Air Act. Any changes to the standard and to the reference method will be made as a result of that re-evaluation.

One commenter was confused as to how Coefficient of Haze (COHs) will be replaced in 40 CFR 51.16 and Appendix L to Part 51. The action to remove COHs resulted from the fact that there is no single, nationally consistent relationship between the tape sampler, which provides particulate concentrations in terms of Coefficient of Haze (COHs), and the Hi-vol which provides data in terms of micrograms per cubic meter. Appendix C allows the use of tape samplers for air pollution episode monitoring, but only if a quantitative relationship to the Hi-vol is established at the use site. The tape sampler data can then be translated directly into micrograms per cubic meter, eliminating the need to express the data in terms of COHs.

Three commenters were confused as to what particulate samplers could be used for monitoring air pollution episodes. It appeared to the commenters

that they would have to develop new methods. As stated above in the discussion of the changes to Appendix C, any method can be used for TSP episode monitoring if it provides real time data and a quantitative relationship to the Hi-vol can be established at the use site. Procedures for using a Hi-vol over short periods or staggered Hi-vols may also be used for episode monitoring.

Three commenters felt that it would be impractical to change the range of an analyzer when concentrations rose above the range limit being used and to change back to a lower range when concentrations fell. As explained above, analyzers may be used continually at higher ranges when the frequency of high concentrations justifies continual use.

Public Comments—Appendix D

The following discussion covers public comments received on the proposed Appendix D to Part 58

One commenter was concerned with calling a CO station that measures maximum concentrations a middle scale station. Since these stations in many cases would represent midblock hotspot concentrations, which is in the microscale, a microscale CO designation has been added to Appendix D.

One commenter suggested that an urban scale station for particulate matter was needed. In response, Appendix D has been modified to indicate that the SLAMS network could contain an urban scale particulate matter station, but there is no requirement for an urban scale NAMS for particulate matter.

One commenter pointed out that while the total required number of TSP and SO_2 NAMS is given in Appendix D, no guidance is given as to how many stations should be in the maximum concentration category and how many should be in the population exposure category. The Appendix has been clarified to indicate that there should be at least one NAMS in each category for each pollutant (TSP and SO_2) but the remaining stations should be categorized based on the characteristics of the area.

One commenter pointed out that there could be difficulty in following the Appendix D instructions to minimize the impact of point sources on NAMS. EPA recognizes the difficulty in locating stations with respect to point source impact. However, EPA believes that the information contained in Appendix E and in the references cited in Appendix E is sufficient for locating stations which are not unduly influenced by any single source.

Two commenters questioned the fact that no NAMS were required for areas under 50,000 population even though there may be violations. As previously stated under the heading "General Discussion," the requirement establishing the number of NAMS necessary for certain areas is not to be considered the minimum number of stations required in the SLAMS network. The NAMS concept is meant to provide timely data from selected stations in the SLAMS network for purposes of national assessment. The national assessment needs will be met by data from areas over 50,000 population. The SLAMS network will also cover areas below 50,000, but none of those stations will be designated NAMS.

One commenter felt that more TSP and SO_2 stations are needed than are required by Appendix D. EPA feels the number of SO_2 and TSP NAMS that are required are sufficient for national data needs. EPA also believes that many more stations will be needed in the SLAMS network than the number required for NAMS. Data from all SLAMS will be considered in any important decisionmaking process.

One commenter suggested deactivating NAMS in selected areas for a year at a time on a rotational basis. This suggestion is contrary to one of the purposes of NAMS; namely, trends analysis. Also, the NAMS will be among the more important stations in the SLAMS network which is further justification for maintaining NAMS in operation.

One commenter favored the use of laser spectroscopy methods to measure TSP over a wide area. As discussed previously, the TSP standard is based on measurements of particulate matter by the TSP reference method which is the Hi-vol sampler. Use of laser spectroscopy would not be appropriate for SLAMS measurements considering the nature of the data produced. The method could, however, be used as SPM or for monitoring TSP episodes if a quantitative correlation to the Hi-vol can be established.

Two commenters felt that meteorological data should be collected at each NAMS. The collection of meteorological data at each NAMS is recommended but not required. At the present time EPA does not believe it would be cost effective to establish such a meteorological data network considering the resources that would be required.

One commenter felt that interstate and inter-regional cooperation is needed for network design. EPA agrees and is striving to attain this goal by having Regional Office involvement in SLAMS network design and by having EPA headquarters involvement in choosing NAMS sites.

Public Comments—Appendix E

The following discussion addresses the public comments received on the proposed Appendix E to Part 58.

One commenter felt that more spatial scales of representativeness were needed in order to classify all the stations in the SLAMS network. EPA agrees and has added more scales. These additional scales will allow more leeway in meeting the monitoring objectives of the SLAMS network.

One commenter requested clarification of the usage of the words "must" and "should" when applied to siting criteria. A statement has been added which stipulates that all "musts" indicate a requirement and all "shoulds" indicate criteria that do not have to be followed but which would be desirable to follow for the sake of consistency.

Eight commenters stated that the siting criteria are too restrictive and one commenter felt that waivers should be granted for some of the required siting criteria. Some of the siting criteria for CO, O_3, and NO_2 have been relaxed. Most of the siting criteria are tied to a specific monitoring scale and if the criteria are not met, the station location might represent a different scale. For those instances where it is impossible to meet a certain siting parameter, a waiver provision has been added. It is anticipated that waivers will primarily be used for existing sites and that stations in new locations will be able to meet the criteria.

Two commenters requested specifications for probe material and residence time of the air sample within the probe. A new section has been added containing probe material and residence time specifications. EPA agrees that these factors are as important as other criteria in terms of the effect on data quality and comparability.

One commenter suggested using the word "probe" instead of "monitor" when specifying siting criteria. This change has been made for clarification in the portions of Appendix E applicable to gases. For TSP it is appropriate to speak in terms of monitor siting.

One commenter felt that the curve specifying setback distances from roads for TSP stations is too restrictive. The wording has been changed to indicate

that the "acceptable zone" defined by the siting criteria is for stations designated as neighborhood, urban, regional, and for most middle scale stations. If a station is located closer to a roadway than specified in the criteria, it would represent a smaller geographical area and thus would most likely be classified as a middle scale station.

One commenter stated that the criterion specifying setback distances from roadways for TSP is ambiguous where it refers to "several thousand vehicles per day." The wording has been changed to read "approximately 3,000 vehicles per day."

One commenter noted a conflict in the criterion establishing distances from roadways for TSP and for CO. CO stations should be located near roadways because the roadway will most likely be the only source of CO. Neighborhood sites for TSP, however, are meant to represent a multisource situation and should be separated from roadways so that the air quality measurements are not totally dominated by the roadway.

One commenter felt that there should be no fixed minimum or maximum setback distances from roadways for CO. A table for neighborhood scale CO station setback distances from roadways based on average daily traffic has been added to Appendix E. This table, consisting of a range of minimum setback distances, will give more leeway for station siting and should result in data which are more comparable from location to location.

Three commenters stated that the minimum roadway setback distances for ozone are too restrictive and two commenters expressed the same opinion about the NO_2 criteria. The roadway setback distances for O_3 and NO_2 have been revised according to new data available since proposal. The criteria are now less restrictive.

One commenter pointed out that for TSP and NO_2, stations cannot be located in areas of hi-rise buildings because of the criterion specifying distance to obstacle heights. Another commenter pointed out the same for SO_2 stations. The criterion alluded to is for neighborhood scale stations. If the criterion cannot be met because a station has to be located such that the distance to an obstacle is less than twice the height of that obstacle above the probe, the station would be classified as a middle scale station.

One commenter indicated that if a monitor probe is located on the side of a building that it will be impossible to meet the criterion of unrestricted air flow in three of four cardinal wind directions. Two other commenters noted that the criterion requiring SO_2 monitor probes to be located less than 80% of the mean height of the building on which the probe is located is in conflict with the 3-wind direction criteria. The language concerning air flow has been changed to read an arc of 270° instead of three to four wind directions. In addition, a statement has been added which stipulates that a monitor probe located on the side of a building must only have unobstructed air flow for 180°. Also, the criteria concerning 80% of mean building height has been deleted since it is redundant. The situation is covered by other SO_2 siting criteria in Appendix E which limits probe height to between 3 and 15 meters.

One commenter indicated that if TSP stations are not allowed to be located in unpaved areas unless there is a vegetative ground cover, large areas around some stations will have to be paved. The criterion concerning unpaved areas is in terms of "should" and not "must". The criterion, therefore, does not have to be strictly followed.

One commenter felt that the criterion establishing minimum distances of O_3 stations from trees cannot be met. The criterion concerning separation of O_3 stations and trees has been put in terms of "should" instead of "must".

Two commenters indicated that the criteria limiting CO monitor probes to 3 meters ± ½ meter above ground is not practical and would require vandal-proof enclosures. EPA understands the concerns of these two commenters; however, the height restrictions are the best compromise that can be made between seeking to be vandal-proof and still representing the breathing zone. It has been determined that there is a significant vertical gradient for CO concentrations in the intercity, street canyon environment. For the neighborhood scale station which is more removed from traffic, the height restriction is not as critical since vertical concentration gradients are not as pronounced. Therefore, as one commenter suggested, the criteria has been changed to allow monitor probes to be located 3 to 15 meters above ground for neighborhood scale stations.

Public Comments—Appendix F

The following discussion pertains to public comments received on the proposed Appendix F of Part 58.

One commenter pointed out that gaseous pollutants as measured on continuous analyzers are in units of parts per million (ppm) and should be reported that way in the annual SLAMS report. EPA agrees and has made appropriate changes to the data reporting requirements.

One commenter requested that EPA address the inconsistency between the use of discrete versus running averages in comparing standards for CO and SO_2. The annual reporting requirements have been modified by requiring that for both CO and SO_2 the highest and second-highest nonoverlapping eight-hour and 24-hour averages, respectively, be reported. These requirements are consistent with the EPA guidance in interpretating air quality data with respect to the standards (OAQPS Guideline No. 1.2-008). Both the SO_2 and CO standards will be reviewed in 1979 and 1980, when a decision on the need to revise the standards will be made. This could change the reporting requirements for these pollutants.

One commenter questioned who would sign the annual SLAMS summary report if some of the data were provided by local agencies to the State. The regulation, § 58.26, has been revised to indicate that the senior air pollution control officer in the State or his designee will certify the accuracy of the report. The certification statement should indicate that the data were collected under regulations that were applicable during the monitoring period. Even though a local agency collects data, the State is still responsible for assuring that the data are collected according to the criteria established in Part 58. If the State is assured of correct data collection, there should be no problem with the report being certified at the State level.

One commenter requested that precision and accuracy information be included in the annual SLAMS summary report. EPA agrees and such a requirement has been added to the regulations.

One commenter felt that the monitoring operating schedule should be included in the annual report. EPA feels that such a requirement would be too burdensome to justify. Inclusion of the monitoring operating schedule in the annual report, however, is encouraged if States have the time and resources and wish to do so.

Public Comments—Appendix G

The following discussion concerns the public comments received on the proposed Appendix G to Part 58.

Nine commenters requested that the descriptor words used to identify air quality conditions for the various ranges of daily air pollution index values be changed. Because the index is for the purpose of achieving national uniformity

of daily air quality reports as required by § 319 of the Act, the use of descriptor words other than those proposed is not permitted unless approved by the EPA Administrator . None of the suggested descriptor words appears superior to those proposed.

Two commenters indicated that the breakpoints separating the air quality index ranges should correspond to levels of State air quality standards and air pollution episodes instead of national standards, national significant harm levels, and EPA suggested episode levels. In order to achieve national uniformity, federal standards, suggested episode levels, and significant harm levels must be used. Index values of 200, 300 and 400 for the most part correspond to the federal alert, warning, and emergency episode levels given in Appendix L to Part 51. However, because many factors, including meteorological conditions, are taken into account before triggering episode control actions, reported index values and the calling of an episode do not always correspond. Variable breakpoints from State to State would not satisfy the § 319 requirements for a uniform index.

The index has been modified to reflect the new ozone NAAQS of 0.12 p.p.m. (235 $\mu g/m^3$) which was promulgated in the **Federal Register** on February 8, 1979 (44 FR 8202). The index value of 100 for ozone corresponds to this new level of the standard. The new standard replaces the previous photochemical oxidant standard level of 0.08 p.p.m. (160 $\mu g/m^3$).

Two commenters disagreed with the proposed procedure of reporting only the index of the pollutant of highest concentration (subindex). They felt that an index based on the reporting of the maximum subindex value would be insufficient and would mask the significance of other pollutants and their impact on health and environmental quality. The Appendix G requirements do not prevent a State from reporting subindices for other pollutants. Appendix G suggests that a State should report the other subindices, but it is left to the State's discretion whether it will be done.

Three commenters suggested basing the TSP subindex on COHs. As stated previously under the discussion of Appendix C, a tape sampler may be used for episode or daily index purposes if a site specific quantitative relationship to the Hi-vol is established.

Two commenters requested that the breakpoint between the good range and the moderate range for TSP and O_3 be raised to account for higher levels which are due to naturally occuring background levels of the two pollutants. EPA disagrees that the breakpoints should be changed. Air quality is good or bad because of ambient concentrations regardless of the source or cause of the concentrations. Language has been added to Appendix G, however, which recommends reporting information and causes for unusually high concentrations.

One commenter was concerned that index values would be used to compare air quality in different areas. EPA does not encourage the use of index values for air quality comparisons from area to area. The index is for the purpose of giving citizens in a specific area an idea of the quality of air they will encounter on a daily basis.

Two commenters stated that EPA should publish health effects criteria before promulgating Appendix G. Specifically, concentrations of SO_2 defined as "significant harm" should be supported by published health effects research data. The EPA Office of Public Affairs has prepared for the public a brochure with discusses the Pollutant Standards Index (PSI) and presents pollutant specific health effects. The brochure (Measuring Air Quality—The New Pollutant Standards Index, July, 1978, OPA, 11/8) is available from the Environmental Protection Agency, Library (MD–35), Research Triangle Park, N.C. 27711. Health effects associated with the significant harm level for SO_2 can be found in "Air Quality Criteria for Sulfur Oxides," U.S. Department of Health, Education, and Welfare, Washington, D.C., AP–50, April 1970. The information in the criteria document will be re-examined by EPA when the SO_2 NAAQS are reviewed during 1979 and 1980. After review of the latest data on health effects and the criteria document, a decision will be made as to the need to revise the SO_2 standards.

One commenter did not think that real-time data will be available for determining a daily index. EPA disagrees and feels that data can be made available at times when it is needed for index calculation.

One commenter felt that public acceptance of the index is doubtful. Since the PSI, which is the basis for the Appendix G index, was published, it has been generally well accepted throughout the country and has been adopted by 15 State agencies and is reported by State or local agencies in 24 States.

One commenter stated that the index is not applicable to a large metropolitan area, such as the Los Angeles Basin. Appendix G recommends that the index be reported for multiple sub-regions within a metropolitan area and should at a minimum include the region with the highest subindex.

One commenter indicated that implementation of this index would create serious administrative problems, especially the proposed recording of index values. The reporting requirements in Appendix G are minimal, requiring that the reporting agency keep annual records of the frequency with which reported index values occur in each of the index descriptor categories.

Two commenters requested that the index be reported on weekends and holidays as well as weekdays. The requirement to report the index only at least five days per week, presummable the normal workweek, does not restrict an agency from reporting every day. If an agency has the resources to do so, EPA encourages index reporting every day.

Two commenters felt that the index breakpoint of 100 for the NO_2 subindex and the subindex for the product of TSP and SO_2 should be based on State short-term standards or their equivalent because there are no short-term standards for NO_2 and the product of SO_2 and TSP. EPA is presently considering a short-term NO_2 standard. (For the other pollutants the breakpoint of 100 is based on short-term NAAQS.) The exemption provision in Appendix G allows a State or local agency to petition the Adminstrator and request such a modification to the index.

Review of Public Comments

Copies of the public comments received on the proposal of these regulations on August 7, 1978, are available for public inspection during normal business hours at the Public Information Reference Unit, 401 M Street, S.W., Washington, D.C. 20460.

Effective date: These regulations promulgated herein take effect on June 11, 1979.

Dated: April 27, 1979.

Douglas M. Costle,
Administrator.

PART 51—REGULATIONS FOR AMBIENT AIR QUALITY MONITORING AND DATA REPORTING

Part 51 of Title 40, *Code of Federal Regulations*, is amended as follows:

1. The table of contents to this part is amended by adding, Subpart J and Subpart O in the appropriate places, the following:

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Subpart J—Ambient Air Quality Surveillance

§ 51.190 Ambient air quality monitoring requirements.

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Subpart O—Miscellaneous Plan Content Requirements

§ 51.285 Public notification.

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Subpart Q—Reports

Air Quality Data Reporting

§ 51.320 Annual air quality data report.

Source Emissions and State Action Reporting

§ 51.321 Annual source emissions and State action report.

§ 51.322 Sources subject to emissions reporting.

§ 51.323 Reportable emissions data and information.

§ 51.324 Progress in plan enforcement.

§ 51.325 Contingency plan actions.

§ 51.326 Reportable revisions.

§ 51.327 Enforcement orders and other State actions.

§ 51.328 Plan prescribed actions.

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2. Section 51.3 is amended by revising the second sentence in paragraph (c) to remove the reference to § 51.17. As amended, § 51.3(c) reads as follows:

§ 51.3 Classification of regions.

* * * * *

(c) * * * The requirements applicable to Priority IA Regions shall be the same as those for other Priority I regions, except that the requirements applicable to Priority II regions under § 51.16 shall apply. * * *

3. Section 51.6 is amended by revising paragraph (e) to remove the reference to the § 51.7 semiannual report and adding a reference to the annual report required by § 51.321. As amended, § 51.6(e) reads as follows:

§ 51.6 Revisions.

* * * * *

(e) Revisions other than those covered by paragraphs (a) and (d) of this section must be identified and described in the next annual report required by § 51.321.

* * * * *

§ 51.7 and 51.17 [Reserved]

4. Sections 51.7 and 51.17 are revoked and reserved.

5. Section 51.13 is amended by revising the second sentence of paragraph (g) to read as follows:

§ 51.13 Control strategy: Sulfur oxides and particulate matter.

* * * * *

(g) * * * Actual measurements must be used where available if based on use of the measurement methods specified in Appendix C to Part 58 of this chapter. * * *

§ 51.15 [Amended]

6. Section 51.15 is amended by revoking paragraph (a)(2).

7. Section 51.16 is amended by removing the two references to "COHs" in paragraph (a). As amended, § 51.16(a) reads as follows:

§ 51.16 Prevention of air pollution emergency episodes.

(a) * * *

Particulate matter—1,000 micrograms/cubic meter; 24-hour average.

Sulfur dioxide and particulate matter combined—product of sulfur dioxide in micrograms/cubic meter, 24-hour average, and particulate matter in micrograms/cubic meter, 24-hour average, equal to 490×10^3.

* * * * *

§ 51.17a [Revoked]

8. Section 51.17a is revoked.

9. Section 51.24 is amended by adding paragraph (n)(3) to read as follows:

§ 51.24 Prevention of significant deterioration of air quality.

* * * * *

(n) * * *

(3) The owner or operator shall meet the requirements of Appendix B to Part 58 of this chapter during the operation of monitoring stations required by paragraph (n)(1) of this section as follows:

(i) No later than January 1, 1980, for existing stations, or

(ii) For new stations, at the time the station is put into operation.

§ 51.59 [Reserved]

10. Section 51.59 is revoked and reserved.

11. Subpart J consisting of § 51.190 is added to read as follows:

Subpart J—Ambient Air Quality Surveillance

§ 51.190 Ambient air quality monitoring requirements.

The requirements for monitoring ambient air quality for purposes of the plan are located in Subpart C of Part 58 of this chapter.

12. Subpart O consisting of § 51.285 is added to read as follows:

Subpart O—Miscellaneous Plan Content Requirements

§ 51.285 Public notification.

By March 1, 1980, the State shall submit a plan revision that contains provisions for:

(a) Notifying the public on a regular basis of instances or areas in which any primary standard was exceeded during any portion of the preceeding calendar year,

(b) Advising the public of the health hazards associated with such an exceedance of a primary standard, and

(c) Increasing public awarness of:

(1) measures which can be taken to prevent a primary standard from being exceeded, and

(2) ways in which the public can participate in regulatory and other efforts to improve air quality.

13. Subpart Q is added to read as follows:

Subpart Q—Reports

Air Quality Data Reporting

§ 51.320 Annual air quality data report.

The requirements for reporting air quality data collected for purposes of the plan are located in Subpart C of Part 58 of this chapter.

Source Emissions and State Action Reporting

§ 51.321 Annual source emissions and State action report.

On an annual (calendar year) basis beginning with calendar year 1979, the State agency shall report to the Administrator (through the appropriate Regional Office) information as specified in Sections 51.323 through 51.326. Reports must be submitted by July 1 of each year for data collected and actions which took place during the period January 1 to December 31 of the previous year.

§ 51.322 Sources subject to emissions reporting.

(a) Point sources subject to the annual emissions reporting requirements of § 51.321 are defined as follows:

(1) For particulate matter, sulfur dioxide, hydrocarbons, and nitrogen dioxide, any facility that actually emits a total of 90.7 metric tons (100 tons) per year or more of any one pollutant.

(2) For carbon monoxide, any facility that actually emits a total of 907 metric tons (1000 tons) per year or more.

(3) For lead or lead compounds measured as elemental lead, any facility that actually emits a total of 4.5 metric tons (5 tons) per year or more.

(b) Annual emissions reporting requirements apply only to emissions of each pollutant from any individual emission point within the facility that emits:

(1) For particulate matter, sulfur dioxide, hydrocarbons, and nitrogen dioxide, 22.7 metric tons (25 tons) per year or more.

(2) For carbon monoxide, 227 metric tons (250 tons) per year or more.

(3) For lead or lead compounds measured as elemental lead, 4.5 metric tons (5 tons) per year or more.

§ 51.323 Reportable emissions data and information.

(a) The State shall submit in the annual report the following emissions data and information:

(1) Emissions of particulate matter, sulfur dioxide, carbon nonoxide, nitrogen dioxide, and hydrocarbons as specified by AEROS Users Manual, Vol. II (EPA 450/2–76–029, OAQPS No. 1.2–039) to be coded into the National Emission Data System (NEDS) points source coding forms, and

(2) Emissions of lead or lead compounds measured as elemental lead as specified by AEROS Users Manual, Vol. II (EPA 450/2–76–029, OAQPS No. 1.2–039) to be coded into the Hazardous and Trace Emissions System (HATREMS) points source coding forms.

(b) Such emissions data and information specified in paragraph (a) of this section must be submitted on either paper forms, punched cards, or magnetic tape in the format of the NEDS point source coding forms or the HATREMS point source coding forms as appropriate.

(c) The emissions data and information specified by paragraph (a) of this section must be submitted in the annual report for any point source for which one or more of the following conditions occurs:

(1) A source achieves compliance at any time within the reporting period with any regulation of an applicable plan,

(2) A new or modified source receives approval to construct during the reporting period or begins operating during the reporting period,

(3) A source ceases operations during the reporting period, or

(4) A source's emissions have changed more than 5% from the most recently submitted emissions data.

(d) If, as determined by the State and the Regional Administrator, the emissions from any point source have not changed more than 5% from the most recently submitted emissions data, the State shall update the year of record of the previously reported data and information specified by paragraph (a) of this section.

§ 51.324 Progress in plan enforcement.

(a) For each point source, the State shall report any achievement made during the reporting period of any increment of progress of compliance schedules required by:

(1) The applicable plan, or

(2) Any enforcement order or other State action required to be submitted pursuant to Section 51.327.

(b) For each point source, the State shall report any enforcement action taken during the reporting period and not submitted under Section 51.327 which results in civil or criminal penalties.

§ 51.325 Contingency plan actions.

The State shall report any measures taken during the reporting period, and an evaluation of their effectiveness, such as those actions specified in the contingency plan required by § 51.16, to stop emissions of air pollutants causing or contributing to any incident of air pollution which corresponds to a stage of episode criteria as established in the contingency plan. The State shall also report an account of any episode stage, as established in the contingency plan, during which no action was taken by the State or local air pollution control agency and an explanation for the failure to take such action.

§ 51.326 Reportable revisions.

The State shall identify and describe all substantive plan revisions during the reporting period of the applicable plan other than revisions to rules and regulations or compliance schedules submitted in accordance with § 51.6(d). Substantive revisions shall include but are not limited to changes in stack-test procedures for determining compliance with applicable regulations, modifications in the projected total manpower needs to carry out the approved plan, and all changes in responsibilities given to local agencies to carry out various portions of the plan.

§ 51.327 Enforcement orders and other State actions.

(a) Any State enforcement order, including any State court order, must be submitted to the Administrator within 60 days of its issuance or adoption by the State.

(b) A State enforcement order or other State action must be submitted as a revision to the applicable implementation plan pursuant to § 51.6 and approved by the Administrator in order to be considered a revision to such plan.

§ 51.328 Plan prescribed actions.

(a) The State shall report on the status and progress of the following actions if the plan prescribed such action:

(1) Obtaining additional resources.

(2) Adopting new laws or regulations.

(3) Conducting studies to provide a basis for further actions directed toward the attainment and maintenance of national standards.

(4) initiating new programs or expanding existing programs for the attainment and maintenance of national standards.

(b) The State shall make the report required under paragraph (a) of this section with the annual report as described in § 51.321, commencing with the first annual reporting period following submission of the plan provision that prescribes such action and ending with the completion of the action on which the State must report.

(c) The Administrator will identify those matters on which the State must report.

Subparts F—I, K—N and P [Reserved]

14. Subparts F through I, K through N, and P are reserved.

15. Appendix L is amended by removing references to "COHs" in paragraphs 1.1(b), 1.1(c), and 1.1(d). As amended, Appendix L reads as follows:

Appendix L—Example Regulations for Prevention of Air Pollution Emergency Episodes

* * * * *

1.1 Episode criteria. * * *

(b) "Alert": * * *

Particulate—375 $\mu g/m^3$, 24-hour average.

SO_2 and particulate combined—product of $SO_2 \mu g/m^3$, 24-hour average and particulate $\mu g/m^3$, 24-hour average equal to 65×10^3.

* * * * *

(c) "Warning": * * *

Particulate—625 $\mu g/m^3$, 24-hour average.

SO_2 and particulate combined—product of $SO_2 \mu g/m^3$, 24-hour average and particulate AG2$\mu g/m^3$, 24-hour average equal to 261×10^3.

* * * * *

(d) "Emergency": * * *

Particulate—875 $\mu g/m^3$, 24-hour average.

SO_2 and particulate combined—product of $SO_2 \mu g/m^3$, 24-hour average and particulate $\mu g/m^3$, 24-hour average equal to 393×10^3.

* * * * *

PART 52—APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS

Part 52 of Title 40, *Code of Federal Regulations*, is amended as follows:

1. Section 52.21 is amended by adding paragraph (n)(3) to read as follows:

§ 52.21 Prevention of significant deterioration of air quality.

* * * * *

(n) * * *

(3) The owner or operator shall meet the requirements of Appendix B to Part 58 of this chapter during the operation of monitoring stations required by paragraph (n)(1) of this section as follows:

(i) No later than January 1, 1980, for existing stations, or

(ii) For new stations, at the time the station is put into operation.

2. The following sections are amended by removing the reference "§ 51.7" and replacing it with the reference "§ 58.35."

§ 52.93(b), second sentence.
§ 52.93(c), second sentence.
§ 52.140(b), second sentence.
§ 52.140(c), second sentence.
§ 52.266(d), first sentence.
§ 52.479(c)(2), second sentence.
§ 52.479(c)(3), second sentence.
§ 52.734(b), second sentence.
§ 52.734(c), third sentence.
§ 52.1077(c)(2), second sentence.
§ 52.1077(c)(3), second sentence.
§ 52.1155(f), first sentence.
§ 52.1593(d), first sentence.
§ 52.2053(b), second sentence.
§ 52.2053(c), third sentence.
§ 52.2298(c), first sentence.
§ 52.2343(b), second sentence.
§ 52.2343(c), second sentence.
§ 52.2427(d)(2), second sentence.
§ 52.2427(d)(3), second sentence.
§ 52.2477(c)(2), second sentence.
§ 52.2477(c)(3), second sentence.

§§ 52.779, 52.2029, 52.2482 [Reserved]

3. Sections 52.779, 52.2029, and 52.2482 are revoked and reserved.

4. Section 52.1160 is amended by revising the last sentence in paragraph (l). As amended, § 52.1160 reads as follows:

§ 52.1160 Monitoring reports.

* * * * *

(l) * * * In addition, all air quality data collected at SLAMS will be summarized and submitted as an annual summary report to the Administrator as required by § 58.26 of this chapter.

* * * * *

5. Section 52.1175 is amended by revising paragraph (a) to read as follows:

§ 52.1175 Compliance schedules.

(a) The requirements of § 51.15(a)(2) of this chapter as of May 31, 1972, (36 FR 22398) are not met since Rule 336.49 of the Michigan Air Pollution Control Commission provides for individual compliance schedules to be submitted to the State Agency by January 1, 1974. This would not be in time for submittal to the Environmental Protection Agency with the first semiannual report.

* * * * *

PART 53—AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS

Part 53 Title 40, *Code of Federal Regulations,* is amended as follows:

§ 53.16 [Amended]

Section 53.16 amended by removing the citation "§ 51.17a(a)(4)" from the third sentence of paragraph (e)(1) and from subdivision (iv) of the first sentence in paragraph (e)(2) and replacing the citations with "section 2.3 of Appendix C to Part 58 of this chapter."

Title 40, *Code of Federal Regulations,* is amended by adding a new Part 58 to read as follows:

PART 58—AMBIENT AIR QUALITY SURVEILLANCE

Subpart A—General Provisions

Sec.
58.1 Definitions.
58.2 Purpose.
58.3 Applicability.

Subpart B—Monitoring Criteria

58.10 Quality assurance.
58.11 Monitoring methods.
58.12 Siting of instruments or instrument probes.
58.13 Operating schedule.
58.14 Special purpose monitors.

Subpart C—State and Local Air Monitoring Stations (SLAMS)

58.20 Air quality surveillance: Plan content.
58.21 SLAMS network design.
58.22 SLAMS methodology.
58.23 Monitoring network completion.
58.24 [Reserved].
58.25 System modification.
58.26 Annual SLAMS summary report.
58.27 Compliance date for air quality data reporting.
58.28 Regional Office SLAMS data acquisition.

Subpart D—National Air Monitoring Stations (NAMS)

58.30 NAMS network establishment.
58.31 NAMS network description.
58.32 NAMS approval.
58.33 NAMS methodology.
58.34 NAMS network completion.
58.35 NAMS data submittal.

Subpart E—Air Quality Index Reporting

58.40 Index reporting.

Subpart F—Federal Monitoring

58.50 Federal monitoring.
58.51 Monitoring other pollutants.

Appendix A—Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS).
Appendix B—Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring.
Appendix C—Ambient Air Quality Monitoring Methodology.
Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS).
Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring.
Appendix F—Annual SLAMS Air Quality Information.
Appendix G—Uniform Air Quality Index and Daily Reporting.

Authority: The provisions of this Part 58 are issued under sections 110, 301(a), 313, and 319 of the Clean Air Act (42 U.S.C. 7410, 7601(a), 7613, 7619).

Subpart A—General Provisions

§ 58.1 Definitions.

As used in this part, all terms not defined herein have the meaning given them in the Act:

(a) "Act" means the Clean Air Act as amended (42 U.S.C. 7401, et seq.).

(b) "SLAMS" means State or Local Air Monitoring Station(s). The SLAMS make up the ambient air quality monitoring network which is required by § 58.20 to be provided for in the State's implementation plan. This definition places no restrictions on the use of the physical structure or facility housing the SLAMS. Any combination of SLAMS and any other monitors (Special Purpose, NAMS, PSD) may occupy the same facility or structure without affecting the respective definitions of those monitoring station.

(c) "NAMS" means National Air Monitoring Station(s). Collectively the NAMS are a subset of the SLAMS ambient air quality monitoring network.

(d) "PSD station" means any station operated for the purpose of establishing the effect on air quality of the emissions from a proposed source for purposes of prevention of significant deterioration as required by § 51.24(n) of Part 51 of this chapter.

(e) "SO_2" means sulfur dioxide.

(f) "NO_2" means nitrogen dioxide.

(g) "CO" means carbon monoxide.

(h) "O_3" means ozone.

(i) "Plan" means an implementation plan, approved or promulgated pursuant to section 110 of the Clean Air Act.

(j) "Administrator" means the Administrator of the Environmental Protection Agency (EPA) or his or her authorized representative.

(k) "Regional Administrator" means the Administrator of one of the ten EPA Regional Offices or his or her authorized representative.

(l) "State agency" means the air pollution control agency primarily responsible for development and implementation of a plan under the Act.

(m) "Local agency" means any local government agency, other than the State agency, which is charged with the responsibility for carrying out a portion of the plan.

(n) "Indian Reservation" means any Federally recognized reservation established by treaty, agreement, executive order, or act of Congress.

(o) "Indian Governing Body" means the governing body of any tribe, band, or group of Indians subject to the jurisdiction of the United States and recognized by the United States as possessing power of self-government.

(p) "Storage and Retrieval of Aerometric Data (SAROAD) system" is a computerized system which stores and reports information relating to ambient air quality.

(q) "SAROAD site identification form" is one of the several forms in the SAROAD system. It is the form which provides a complete description of the site (and its surroundings) of an ambient air quality monitoring station.

§ 58.2 Purpose.

(a) This part contains criteria and requirements for ambient air quality monitoring and requirements for reporting ambient air quality data and information. The monitoring criteria pertain to the following areas:

(1) Quality assurance procedures for monitor operation and data handling.

(2) Methodology used in monitoring stations.

(3) Operating schedule.

(4) Siting parameters for instruments or instrument probes.

(b) The requirements pertaining to provisions for an air quality surveillance system in the State Implementation Plan are contained in this part.

(c) This part also acts to establish a national ambient air quality monitoring network for the purpose of providing timely air quality data upon which to base national assessments and policy decisions. This network will be operated by the States and will consist of certain selected stations from the States' SLAMS networks. These selected stations will remain as SLAMS and will continue to meet any applicable requirements on SLAMS. The stations, however, will also be designated as National Air Monitoring Stations (NAMS) and will be subject to additional data reporting and monitoring methodology requirements as contained in Subpart D of this part.

(d) Requirements for the daily reporting of an index of ambient air quality, to insure that the population of major urban areas are informed daily of local air quality conditions, are also included in this part.

§ 58.3 Applicability.

This part applies to:

(a) State air pollution control agencies.

(b) Any local air pollution control agency or Indian governing body to which the State has delegated authority to operate a portion of the State's SLAMS network.

(c) Owners or operators of proposed sources.

Subpart B—Monitoring Criteria

§ 58.10 Quality assurance.

(a) Appendix A to this part contains quality assurance criteria to be followed when operating the SLAMS network.

(b) Appendix B to this part contains the quality assurance criteria to be followed by the owner or operator of a proposed source when operating a PSD station.

§ 58.11 Monitoring methods.

Appendix C to this part contains the criteria to be followed in determining acceptable monitoring methods or instruments for use in SLAMS.

§ 58.12 Siting of instruments or instrument probes.

Appendix E to this part contains criteria for siting instruments or instrument probes for SLAMS.

§ 58.13 Operating schedule.

Ambient air quality data collected at any SLAMS must be collected as follows:

(a) For continuous analyzers—consecutive hourly averages except during:

(1) Periods of routine maintenance,

(2) Periods of instrument calibration, or

(3) periods or seasons exempted by the Regional Administrator.

(b) For manual methods—at least one 24-hour sample every six days except during periods or seasons exempted by the Regional Administrator.

§ 58.14 Special purpose monitors.

Any ambient air quality monitoring station other than a SLAMS or PSD station from which the State intends to use the data as part of a control strategy demonstration or as support for a plan revision must meet the requirements for SLAMS described in § 58.22 and, after January 1, 1983, meet the requirements for SLAMS described in § 58.13 and Appendices A and E to this part.

Subpart C—State and Local Air Monitoring Stations (SLAMS)

§ 58.20 Air quality surveillance: Plan content.

By January 1, 1980, the State shall adopt and submit to the Administrator a revision to the plan which will:

(a) Provide for the establishment of an air quality surveillance system that consists of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) which measure ambient concentrations of those pollutants for which standards have been established in Part 50 of this chapter.

(b) Provide for meeting the requirements of Appendices A, C, D, and E to this part.

(c) Provide for the operation of at least one SLAMS per pollutant during any stage of an air pollution episode as defined in the contingency plan.

(d) Provide for the review of the air quality surveillance system on an annual basis to determine if the system meets the monitoring objectives defined in Appendix D to this part. Such review must identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of new stations which are necessary.

(e) Provide for having a SLAMS network description available for public inspection and submission to the Administrator upon request. The network description must be available at the time of plan revision submittal and must contain the following information for each SLAMS:

(1) The SAROAD site identification form for existing stations.

(2) The proposed location for scheduled stations.

(3) The sampling and analysis method.

(4) The operating schedule.

(5) The monitoring objective and spatial scale of representativeness as defined in Appendix D to this part.

(6) A schedule for;

(i) locating, placing into operation, and making available the SAROAD site identification form for each SLAMS which is not located and operating at the time of plan revision submittal,

(ii) implementing quality assurance procedures of Appendix A to this part for each SLAMS for which such procedures are not implemented at the time of plan revision submittal, and

(iii) resiting each SLAMS which does not meet the requirements of Appendix E to this part at the time of plan revision submittal.

§ 58.21 SLAMS network design.

The design criteria for SLAMS contained in Appendix D to this part must be used in designing the SLAMS network. The State shall consult with the Regional Administrator during the network design process. The final network design will be subject to the approval of the Regional Administrator.

§ 58.22 SLAMS methodology.

Each SLAMS must meet the monitoring methodology requirements of Appendix C to this part at the time the station is put into operation as a SLAMS.

§ 58.23 Monitoring network completion.

By January 1, 1983:

(a) Each station in the SLAMS network must be in operation, be sited in accordance with the criteria in Appendix E to this part, and be located as described on the station's SAROAD site identification form, and

(b) The quality assurance requirements of Appendix A to this part must be fully implemented.

§ 58.24 [Reserved].

§ 58.25 System modification.

The State shall annually develop and implement a schedule to modify the ambient air quality monitoring network to eliminate any unnecessary stations or to correct any inadequacies indicated by the result of the annual review required by § 58.20(d). The State shall consult with the Regional Administrator during the development of the schedule to modify the monitoring program. The final schedule and modifications will be subject to the approval of the Regional Administrator. Nothing in this section will preclude the State, with the approval of the Regional Administrator, from making modifications to the SLAMS network for reasons other than those resulting from the annual review.

§ 58.26 Annual SLAMS summary report.

(a) The State shall submit to the Administrator (through the appropriate Regional Office) an annual summary report of all the ambient air quality monitoring data from all monitoring stations designated State and Local Air Monitoring Stations (SLAMS). The annual report must be submitted by July 1 of each year for data collected from January 1 to December 31 of the previous year.

(b) The annual summary report must contain:

(1) The information specified in Appendix F,

(2) The annual precision and accuracy information described in Section 5.2 of Appendix A, and

(3) The location, date, pollution source, and duration of each incident of air pollution during which ambient levels of a pollutant reached or exceeded the level specified by § 51.16(a) of this chapter as a level which could cause significant harm to the health of persons.

(c) The senior air pollution control officer in the State or his designee shall certify that the annual summary report is accurate to the best of his knowledge.

§ 58.27 Compliance date for air quality data reporting.

The annual air quality data reporting requirements of § 58.26 apply to data collected after December 31, 1980. Data collected before January 1, 1981, must be reported under the reporting procedures in effect before the effective date of Subpart C of this part.

§ 58.28 Regional Office SLAMS data acquisition.

The State shall submit all or a portion of the SLAMS data to the Regional Administrator upon his request.

Subpart D—National Air Monitoring Stations (NAMS)

§ 58.30 NAMS network establishment.

(a) By January 1, 1980, the State shall:

(1) Establish, through the operation of stations or through a schedule for locating and placing stations into operation, that portion of a National Ambient Air Quality Monitoring Network which is in that State, and

(2) Submit to the Administrator (through the appropriate Regional Office) a description of that State's portion of the network.

(b) Hereinafter, the portion of the national network in any State will be referred to as the NAMS network.

(c) The stations in the NAMS network must be stations from the SLAMS network required by § 58.20.

(d) The requirements of Appendix D to this part must be met when designing the NAMS network. The process of designing the NAMS network must be part of the process of designing the SLAMS network as explained in Appendix D to this part.

§ 58.31 NAMS network description.

The NAMS network description required by § 58.30 must contain the following for all stations, existing or scheduled:

(a) The SAROAD site identification form for existing stations.

(b) The proposed location for scheduled stations.

(c) Identity of the urban area represented.

(d) The sampling and analysis method.

(e) The operating schedule.

(f) The monitoring objective and spatial scale of representativeness as defined in Appendix D to this part.

(g) A schedule for:

(1) Locating, placing into operation, and submitting the SAROAD site identification form for each NAMS which is not located and operating at the time of network description submittal,

(2) Implementing quality assurance procedures of Appendix A to this part for each NAMS for which such procedures are not implemented at the time of network description submittal, and

(3) Resiting each NAMS which does not meet the requirements of Appendix E to this part at the time of network description submittal.

§ 58.32 NAMS approval.

The NAMS network required by § 58.30 is subject to the approval of the Administrator. Such approval will be contingent upon completion of the network description as outlined in § 58.31 and upon conformance to the NAMS design criteria contained in Appendix D to this part.

§ 58.33 NAMS methodology.

Each NAMS must meet the monitoring methodology requirements of Appendix C to this part applicable to NAMS at the time the station is put into operation as a NAMS.

§ 58.34 NAMS network completion.

By January 1, 1981:

(a) Each NAMS must be in operation, be sited in accordance with the criteria in Appendix E to this part, and be located as described in the station's SAROAD site identification form; and

(b) The quality assurance requirements of Appendix A to this part must be fully implemented for all NAMS.

§ 58.35 NAMS data submittal.

(a) The requirements of this section apply only to those stations designated as NAMS by the network description required by § 58.30.

(b) The State shall report quarterly to the Administrator (through the

appropriate Regional Office) all ambient air quality data and information specified by AEROS Users Manual (EPA–450/2–76–029, OAQPS No. 1.2–039) to be coded into the SAROAD Air Quality Data forms. Such air quality data and information must be submitted on either paper forms, punched cards, or magnetic tape in the format of the SAROAD Air Quality Data forms.

(c) The quarterly reporting periods are January 1–March 31, April 1–June 30, July 1–September 30, and October 1–December 31. The quarterly report must:

(1) Be submitted within 90 days of the end of each reporting period, and

(2) Contain all data and information gathered during the reporting period.

(d) The first quarterly report will be due on or before June 30, 1981, for data collected during the first quarter of 1981.

(e) Air quality data submitted in the quarterly report must have been edited and validated so that such data are ready to be entered into the SAROAD data files. Procedures for editing and validating data are described in AEROS Users Manual (EPA–450/2–76–029, OAQPS No. 1.2–039).

(f) This section does not permit a State to exempt those SLAMS which are also designated as NAMS from all or any of the reporting requirements applicable to SLAMS in § 58.26.

Subpart E—Air Quality Index Reporting

§ 58.40 Index reporting.

(a) The State shall report to the general public on a daily basis through prominent notice an air quality index in accordance with the requirements of Appendix G to this part.

(b) Reporting must commence by January 1, 1981, for all urban areas with a population exceeding 500,000, and by January 1, 1983, for all urban areas with a population exceeding 200,000.

(c) The population of urban areas for purposes of index reporting are as defined in "1970 Census of Population; Supplementary Report: Population of Urbanized Areas Established Since the 1970 Census, for the United States; 1970," U.S. Bureau of Census, PC(S)–108, U.S. Government Printing Office, Washington, D.C., October, 1976.

Subpart F—Federal Monitoring

§ 58.50 Federal monitoring.

The Administrator may locate and operate an ambient air monitoring station if the State fails to locate, or schedule to be located, during the initial network design process or as a result of the annual review required by § 58.20(d):

(a) A SLAMS at a site which is necessary in the judgment of the Regional Administrator to meet the objectives defined in Appendix D to this part, or

(b) A NAMS at a site which is necessary in the judgment of the Administrator for meeting EPA national data needs.

§ 58.51 Monitoring other pollutants.

The Administrator may promulgate criteria similar to that referenced in Subpart B of this part for monitoring a pollutant for which a National Ambient Air Quality Standard does not exist. Such an action would be taken whenever the Administrator determines that a nationwide monitoring program is necessary to monitor such a pollutant.

Appendix A. Quality Assurance Requirements For State and Local Air Monitoring Stations (SLAMS)

1. General Information

This Appendix specifies the minimum quality assurance requirements for SLAMS networks. These requirements are regarded as the minimum necessary for the control and assessment of the quality of the ambient air monitoring data submitted to EPA. States are encouraged to develop and implement quality assurance programs more extensive than the minimum required or to continue such programs where they already exist.

The quality assurance program specified herein must be fully implemented by the dates specified in § 58.23 and § 58.34(b). Earlier implementation is encouraged.

Quality Assurance consists of two distinct and equally important functions. One function is the assessment of the quality of the monitoring data by estimating their precision and accuracy. The other function is the control, and improvement, of the quality of the monitoring data by implementation of quality control policies, procedures, and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable.

In order to provide uniformity in the assessment and reporting of data quality among all SLAMS networks, the assessment procedures are specified explicitly in sections 3, 4, and 5 of this Appendix.

In contrast, the control and corrective action function encompasses a variety of policies, procedures, specifications, standards, and corrective measures which have varying effects on the resulting data quality. The selection and degree of specific control measures and corrective actions used depend on a number of factors such as the monitoring methods and equipment used, field and laboratory conditions, the objectives of the monitoring, the level of the data quality needed, the expertise of assigned personnel, the cost of control procedures, pollutant concentration levels, etc. Accordingly, quality control requirements are specified in general terms, in section 2 of this Appendix, to allow each State to develop a quality control system which is most effective for its own circumstances.

2. Quality Control Requirements

2.1 Each State must develop and implement a quality control program consisting of policies, procedures, specifications, standards, and documentation necessary to:

(1) Provide data of adequate quality to meet monitoring objectives.

(2) Minimize loss of air quality data due to malfunctions or out-or-control conditions.

The quality control program must be described in detail, suitably documented, and approved by the Regional Administrator or his designee. The quality control program will be reviewed during the annual system audit described in section 2.4

2.2 Primary guidance for developing the quality control programs is contained in references 1 and 2, which also contain many suggested procedures, checks, and control specifications. Many specific quality control checks and specifications for manual methods are included in the respective reference methods described in Part 50 of this chapter or in the respective equivalent method descriptions available from EPA (see reference 5). Similarly, quality control procedures related to specifically designated reference and equivalent analyzers are contained in their respective operation and instruction manuals. This guidance, and any other pertinent information from appropriate sources, should be used by the States in developing their quality control programs.

As a minimum, each quality control program must have operational procedures for each of the following activities:

(1) Selection of methods, analyzers, or samplers.

(2) Installation of equipment.

(3) Calibration.

(4) Zero/span checks and adjustments of automated analyzers.

(5) Control checks and their frequency.

(6) Control limits for zero, span and other control checks, and respective corrective actions when such limits are surpassed.

(7) Calibration and zero/span checks for multiple range analyzers (see § 2.6 of Appendix C of this Part).

(8) Preventive and remedial maintenance.

(9) Quality control procedures for air pollution episode monitoring.

(10) Recording and validating data.

(11) Documentation of quality control information.

2.3 Pollutant Standards.

2.3.1 Gaseous standards (permeation tubes, permeation devices or cylinders of compressed gas) used to obtain test concentrations for CO, SO_2, and NO_2 must be working standards certified by comparison to a National Bureau of Standards (NBS) gaseous Standard Reference Material (SRM). A traceability protocol for certifying a working standard by direct comparison to an NBS SRM is given in reference 3. Direct use of an NBS SRM as a working standard is not prohibited but is discouraged because of their limited supply and expense.

2.3.2 Test concentrations for ozone must be obtained in accordance with the UV photometric calibration procedure specified in Appendix D of Part 50 of this chapter, or by means of an ozone transfer standard which has been certified. Consult reference 4 for guidance on ozone transfer standards.

2.3.3 Flow measurements must be made by a flow measuring instrument which is traceable to an authoritative volume or other standard.

2.4 National Performance and System Audit Programs

Agencies operating all or a portion of a SLAMS network are required to participate in EPA's national performance audit program and to permit an annual EPA system audit of their ambient air monitoring program. See section 1.4.16 of reference 1 and reference 6 for additional information about these programs. Agencies should contact either the appropriate EPA Regional Quality Control Coordinator or the Quality Assurance Branch, EMSL/RTP, at the address given in reference 3 for instructions for participation.

3. Data Quality Assessment Requirements

Data quality is measured (below), specified (section 4), and reported (section 5) on the basis of "reporting organizations." A reporting organization is defined as a State or subordinate organization within a State which is responsible for a set of stations which monitor the same pollutant and for which precision and accuracy assessments can be pooled. States must define one or more reporting organizations for each pollutant such that each monitoring station in the State SLAMS network is included in one, and only one, reporting organization.

Each reporting organization shall be defined such that precision and accuracy among all stations in the organization can be expected to be reasonably homogeneous, as a result of common factors. Common factors which should be considered by States in defining reporting organizations include: (1) operation by a common team of field operators, (2) common calibration facilities, and (3) support by a common laboratory or headquarters. Where there is uncertainty in defining the reporting organizations or in assigning specific sites to reporting organizations, States must consult with the appropriate EPA Regional Office for guidance.

3.1 *Automated Methods.*

3.1.1 *Precision.* A one-point precision check must be carried out at least once every two weeks on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.08 and 0.10 ppm for SO_2, NO_2, and O_3 analyzers, and between 8 and 10 ppm for CO analyzers. The standards from which precision check test concentrations are obtained must meet the specifications of section 2.3. Except for certain CO analyzers described below, analyzers must operate in their normal sampling mode during the precision check, and the test atmosphere must pass through all filters, scrubbers, conditioners and other components used during normal ambient sampling and as much of the ambient air inlet system as is practicable. If permitted by the associated operation or instruction manual, a CO analyzer may be temporarily modified during the precision check to reduce vent or purge flows, or the test atmosphere may enter the analyzer at a point other than the normal sample inlet, *provided that* the analyzer's response is not likely to be altered by these deviations from the normal operational mode. If a precision check is made in conjunction with a zero/span adjustment, it must be made prior to such zero and span adjustments.

The difference between the actual concentration of the precision check gas and the concentration indicated by the analyzer is used to assess the precision of the monitoring data as described in section 4.1.1. Report data only from automated analyzers that are approved for use in the SLAMS network.

3.1.2 *Accuracy.* Each calendar quarter audit at least 25 percent of the SLAMS analyzers that monitor for SO_2, NO_2, O_3 or CO such that each analyzer is audited at least once per year. If there are fewer than four analyzers for a pollutant within a reporting organization, randomly reaudit one or more analyzers so that at least one analyzer for that pollutant is audited each calendar quarter.

The audit is made by challenging the analyzer with at least one audit gas of known concentration from each of the following ranges which fall within the measurement range of the analyzer being audited:

Audit point	Concentration range, ppm	
	SO_2, NO_2, O_3	CO
1	0.03-0.08	3-8
2	0.15-0.20	15-20
3	0.40-0.45	40-45
4	0.80-0.90	80-90

The standards from which audit gas test concentrations are obtained must meet the specifications of section 2.3. Working or transfer standards and equipment used for auditing must be different from the standards and equipment used for calibration and spanning. The auditing standards and calibration standards may be referenced to the same NBS SRM or primary UV photometer. The auditor should not be the operator/analyst who conducts the routine monitoring, calibration, and analysis.

The audit shall be carried out by allowing the analyzer to analyze an audit test atmosphere in the same manner as described for precision checks in section 3.1.1. The excepting given in section 3.1.1 for certain CO analyzers does not apply for audits.

The difference between the actual concentration of the audit test gas and the concentration indicated by the analyzer is used to assess the accuracy of the monitoring data as described in section 4.1.2. Report data only from automated analyzers that are approved for use in the SLAMS network.

3.2 *Manual Methods.*

3.2.1 *Precision.* Within each reporting organization, select at least two sites for duplicate sampling and collocate two samplers at each selected site. Although only two pairs of collocated samplers are required to estimate the precision of a reporting organization, additional collocated sampling is encouraged. Sites with the highest expected geometric mean concentration must be selected or, if such sites are impractical, alternate sites approved by the Regional Administrator may be selected. The two samplers must be within 4 meters of each other, and high-volume samplers must be at least 2 meters apart to preclude airflow interference. Calibration, sampling and analysis must be the same for both collocated samplers as well as for all other samplers in the network. The collocated samplers must be operated whenever routine sampling is scheduled. For each pair of collocated samplers, designate one as the sampler which will be used to report air quality for the site and designate the other as the duplicate sampler. The differences in measured concentration ($\mu g/m^3$) between the two collocated samplers are used to calculate precision as described in section 4.2.1.

3.2.2 *Accuracy.* The accuracy of manual sampling methods is assessed by auditing a portion of the measurement process. For TSP, the flow rate during sample collection is audited. For the SO_2 and NO_2 methods, the analytical measurement is audited.

(a) *TSP Method.* (Appendix B of Part 50 of this chapter). Each calendar quarter, audit the flow rate of at least 25 percent of the high-volume samplers such that each sampler is audited at least once per year. If there are fewer than four high-volume samplers within a reporting organization, randomly reaudit one or more samplers so that one sampler is audited each calendar quarter.

Audit the flow rate at one flow rate using a reference flow device described in section 2.2.8, pages 3–5, of reference 2, or a similar transfer flow standard. The device used for auditing must be different from the one used to calibrate the flow of the high-volume sample being audited. The auditing device and the calibration device may both be referenced to the same primary flow standard. With the audit device and a normal glass fiber filter in place, operate the high-volume sampler at its normal flow rate. The difference in flow rate (in m^3/min) between the audit flow measurement and the flow indicated by the sampler's normal flow indicator are used to calculate accuracy as described in section 4.2.2.

Great care must be used in auditing high-volume samplers having flow regulators because the introduction of resistance plates in the audit device can cause abnormal flow patterns at the point of flow sensing. For this reason, the orifice of the flow audit device should be used without resistance plates in auditing flow regulated high-volume samplers, or other steps should be taken to assure that flow patterns are not perturbed at the point of flow sensing.

(b) *SO_2 Methods.* Prepare audit solutions from a working sulfite-TCM solution as described in section 6.2.9 of the SO_2 Reference Method (40 CFR 50, Appendix A). These audit samples must be prepared independently from the standardized sulfite solutions used in the routine analysis procedure. New sulfite-TCM audit samples

must be prepared every 30 days and must be stored between 0 and 5°C.

Prepare audit samples in each of the concentration ranges of 0.2–0.3, 0.5–0.6, and 0.8–0.9 μg SO_2/ml. Analyze an audit sample in each of the three ranges at least once each day that samples are analyzed and at least twice per calendar quarter. The differences between the audit concentrations (in μg SO_2/ml) and the indicated concentrations (in μg SO_2/ml) are used to calculate accuracy as described in section 4.2.2.

(c) *NO_2 Methods.* Prepare audit solutions from a working sodium nitrite solution as described in the appropriate equivalent method (see reference 5). These audit samples must be prepared independently from the standardized nitrate solution used in the routine analysis procedure. New aqueous sodium nitrate audit samples must be prepared every three months. Prepare audit samples in each of the concentration ranges of 0.2–0.3, 0.5–0.6, and 0.8–0.9 μg NO_2/ml. Analyze an audit sample in each of the three ranges at least once each day that samples are analyzed and at least twice per calendar quarter. The differences between the audit concentrations (in μg NO_2/ml) and the indicated concentrations (in μg NO_2/ml) are used to calculate accuracy as described in section 4.2.2.

4. Calculations For Data Quality Assessment

4.1 *Automated Methods.*

4.1.1 *Precision.* Estimates of the precision are calculated from the results of biweekly precision checks as specified in section 3.1.1. At the end of each calendar quarter calculate a combined precision probability interval for all SLAMS analyzers in the reporting organization for each pollutant. Directions for calculations are given below and directions for reporting are given in section 5. DO NOT include results from non-approved analyzers in the calculation of precision estimates. If monitoring data is invalidated during the entire period represented by a given precision check, the results of that precision check shall be excluded from the calculations.

(a) *Single Analyzer Precision.*

Calculate the percentage difference (d_i) for each precision check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \qquad (1)$$

where:

Y_i = analyzer's indicated concentration from the i-th precision check.

X_i = known concentration of test gas used for the i-th precision check.

For each instrument, calculate the quarterly average ($\bar{d}_j$), equation 2, and the standard deviation (S_j), equation 3.

$$\bar{d}_j = \frac{1}{n}\sum_{i=1}^{n} d_i \qquad (2)$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_{i=1}^{n} d_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} d_i\right)^2\right]} \qquad (3)$$

where n is the number of precision checks on the instrument made during the calendar quarter. For example, n should be 6 or 7 if precision checks are made biweekly during a quarter.

(b) *Precision for Reporting Organization.*

For each pollutant, calculate the average of averages (D) and pooled standard deviation (S_a) for all analyzers monitoring the pollutant using either equations 4 and 5 or 4a and 5a.

$$D = \frac{1}{k}\sum_{j=1}^{k} \bar{d}_j \qquad (4)$$

$$S_a = \sqrt{\frac{1}{k}\sum_{j=1}^{k} S_j^2} \qquad (5),$$

where k is the number of analyzers within the reporting organization for a single pollutant. Use equations 4 and 5 when the same number of precision checks are made for each instrument. Otherwise, use equations 4a and 5a to obtain a weighted average and a weighted standard deviation.

$$D = \frac{n_1\bar{d}_1 + n_2\bar{d}_2 + \ldots + n_j\bar{d}_j + \ldots + n_k\bar{d}_k}{n_1 + n_2 + \ldots + n_j + \ldots + n_k} \qquad (4a)$$

$$S_a = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2 + \ldots + (n_j - 1)S_j^2 + \ldots + (n_k - 1)S_k^2}{n_1 + n_2 + \ldots + n_j + \ldots + n_k - k}} \qquad (5a)$$

For each pollutant, calculate the 95 Percent Probability Limits for the precision of a reporting organization using equations 6 and 7 and record these limits on the front of Form 1 (Figure 1) under columns 22–27. (See section 5 for explanation of Form 1).

Upper 95 Percent Probability Limit = $D + 1.96\ S_a$, (6)

Lower 95 Percent Probability Limit = $D - 1.96\ S_a$, (7)

4.1.2 *Accuracy.* Estimates of the accuracy are calculated from the results of independent audits as described in section 3.1.2. At the end of each calendar quarter calculate a combined accuracy probability interval for all SLAMS analyzers in the reporting organization for each pollutant. Separate probability limits are calculated for each audit concentration level listed in section 3.1.2. Directions for calculations are given below (directions for reporting are given in section 5). DO NOT include results from nonapproved analyzers in the calculation.

(a) *Single Analyzer Accuracy.* Calculate the percentage difference (d_i) for each audit concentration using equation 1 where Y_i is the analyzer's indicated concentration from the i-th audit check and X_i is the known concentration of the audit gas used for the i-th audit check.

(b) *Accuracy for Reporting Organization.* Using equation 8, calculate, for each audit concentration level, the average (D) of the individual percentage differences (d_i) for all k analyzers measuring a given pollutant audited during the quarter.

$$\bar{D} = \frac{1}{k}\sum_{i=1}^{k} d_i \qquad (8)$$

For each concentration level, calculate the standard deviation (S_a) of all the individual percentage differences for all analyzers audited during the quarter, using equation 9. Repeat for each pollutant.

$$S_a = \sqrt{\frac{1}{k-1}\left[\sum_{i=1}^{k} d_i^2 - \frac{1}{k}\left(\sum_{i=1}^{k} d_i\right)^2\right]} \qquad (9)$$

For reporting organizations having four or fewer analyzers for a particular pollutant, only one audit is required each quarter. Therefore, the average and standard deviation cannot be calculated. For such reporting units, the audit results of two consecutive quarters are required to calculate an average and a standard deviation using equations 8 and 9, and the reporting of probability limits are therefore required on a semi-annual (instead of a quarterly) basis. For each pollutant, calculate the 95 Percent Probability Limits for the accuracy of a reporting organization at each audit concentration level using equations 6 and 7 and record these limits on the front of Form 1 (Figure 1) under columns 39–62. (See section 5 for explanation of Form 1).

4.2 *Manual Methods.*

4.2.1. *Precision.* Estimates of the precision are calculated from the results obtained from collocation of two samplers as described in section 3.2.1. At the end of each calendar quarter, calculate a combined precision probability interval for all collocated samplers for each pollutant. Directions for calculation are given below and directions for reporting are given in section 5.

(a) *Single Instrument Precision.* For each of the paired measurements described in section 3.2.1, calculate the percentage difference (d_i) using equation 1 where Y_i is the concentration of pollutant measured by the duplicate sampler and X_i is the concentration of pollutant measured by the sampler reporting air quality for the site. For each site, calculate the quarterly average percentage difference ($\bar{d}_i$), equation 2, and the standard deviation (S_i), equation 3.

At low concentrations, agreement between the measurements of collocated samplers, expressed as 95 Percent Probability Limits, may be poor. For this reason a separate count is made of the occurrence of pollutant measurements below specified levels. Count the number of samples from all collocated sites which indicate a measurement from a sampler reporting air quality for the site (See section 3.2.1) below the following limits:

TSP—less than 20 $\mu g/m^3$
SO_2—less than 40 $\mu g/m^3$
NO_2—less than 30 $\mu g/m^3$

Report the counts on columns 20–23 of Form 1 (Back).

(b) *Precision for Reporting Organization.* For each pollutant, calculate the average percentage difference (D) and pooled standard deviation (S_a) using equations 4 and 5, or using equations 4a and 5a if different numbers of paired measurements are made at the collocated sites. For these calculations, the k of equations 4, 5, 4a and 5a is the number of samplers at collocated sites designated to report air quality. Results from all collocated sampling sites shall be reported.

Calculate the 95 Percent Probability Limits for the precision of a reporting unit, using equations 10 and 11, and record them in columns 24–29 on the back of Form 1 (See section 5 for explanation of Form 1).

Upper 95 Percent Probability Limit = $\bar{D} + 1.96\, S_a/\sqrt{2}$ (10)

Lower 95 Percent Probability Limit = $\bar{D} - 1.96\, S_a/\sqrt{2}$ (11)

4.2.2 *Accuracy.*

(a) *Single Sampler Accuracy (TSP).* For the flow rate audit described in section 3.2.2(a), let X_i represent the known flow rate and Y_i represent the indicated flow rate. Calculate the percentage difference (d_i) for each audit using equation 1.

(b) *Accuracy for Reporting Organization (TSP).* Using equation 8 calculate the average (D) of the individual percent differences for all high-volume samplers audited during the calendar quarter. Compute the standard deviation (S_a) of all the percentage differences for all of the instruments audited during the calendar quarter using equation 9.

Calculate the 95 Percent Probability Limits for the accuracy of a reporting organization using equations 6 and 7, and record these limits on the back of Form 1 under columns 46–51. Note that since the audit is conducted at only one level, columns 40–45 and 52–57 are not used. For reporting organizations having four or fewer high-volume samplers for TSP, only one audit is required each quarter. For such reporting organizations, the audit results of two consecutive quarters are required to calculate an average and a standard deviation using equations 8 and 9. Therefore, semi-annual reporting (instead of quarterly) of probability limits is required.

(c) *Single-Analysis-Day Accuracy (SO_2 and NO_2).* For each of the audits of the analysis for SO_2 or NO_2 described in section 3.2.2 (b) and (c), let X_i represent the known value of the audit sample and Y_i the indicated value of SO_2 or NO_2. Calculate the percentage difference (d_i) for each audit at each concentration level using equation 1.

(d) *Accuracy for Reporting Organization (SO_2 and NO_2).* Calculate the average (D) of the percent differences at each concentration level for all analysis days during the quarter using equation 8. Compute the standard deviation (S_a) of the individual percentage differences using equation 9. Calculate the 95 Percent Probability Limits for the accuracy for the reporting organization using equations 6 and 7 and record these limits on the back of Form 1 for each concentration level under columns 40–57.

5. Reporting Requirements

For each pollutant, prepare a list of all monitoring sites and their SAROAD site identification codes in each reporting organization and submit the list to the Regional Office, with a copy to Environmental Monitoring and Support Laboratory (MD–75), U.S. Environmental Protection Agency, Research Triangle Park, NC 27711 (EMSL/RTP). Whenever there is a change in the assignment of a monitoring site in a reporting organization, report this change to the Regional Office and to EMSL/RTP.

5.1 *Quarterly Reports.*

For each reporting organization fill out form 1 (Front) and (Back) according to the directions given below, and submit the form within 90 days of the end of the quarter to the appropriate Regional Office, with a copy to EMSL/RTP.

5.2 *Annual Reports.*

Compute simple unweighted arithmetic averages of the probability limits for precision and accuracy from the four quarterly periods of the calendar year and report them with the annual SLAMS report required by 58.26. Also include in the SLAMS annual report a listing by pollutant, of the monitoring sites in each reporting organization within the state.

5.3 *Instructions for Form 1.*

General Information (Form 1, Front and Back)

Block No.	Description
1–2	*SAROAD State:* The two digit SAROAD State code.
3–5	*Reporting Organization:* A unique 3-digit code assigned by each State to each of its respective reporting organizations.
6–7	*Year:* Last two digits of the calendar year.
8	*Quarter:* for SLAMS/NAMS Quarterly Report: Enter 1, 2, 3 or 4 to refer to calendar quarter the monitoring data and quality assessments were made. For SLAMS *Annual* Report: Enter 0 to indicate annual SLAMS report.

Automated Analyzers (Form 1, Front)

9–14	*Pollutant Identifiers:* Precoded.
28–33	(Rows labeled "E" are available for future additional pollutants.)
15–17	*Number of Analyzers:* Count only the number of approved analyzers in the network that report monitoring data for each pollutant.
18–21	*Number of Precision Checks:* Count the total number of precision checks included in the calculations reported.
22–24	*Lower Probability Limit, Precision:* Block 22 is either "+" or "−". Blocks 22–24 contain the percentage (round off to a whole number) obtained from equation 7.

Block No.	Automated Analyzers (Form 1, Front) —Continued
25–27	*Upper Probability Limit, Precision:* Block 25 is either "+" or "−". Blocks 26–27 contain the percentage obtained from equation 6. Note: If precision limits exceed two digits, e.g., 103% report as *99*.
34–35	*Source of Audit Gas:* For accuracy determination, refer to code table, note 2, on the form.
36–38	*Number of Audits:* Report the total number of multipoint audits performed on the analyzers.
39–62	*Probability Limits, Accuracy:* The lower and upper probability limits for each pollutant concentration level of the accuracy audits are entered in blocks 39–62. Levels, their corresponding concentration ranges for each pollutant and the appropriate blocks for this information are given in the following table.

Blocks	Levels	Pollutant Concentration Range, ppm	
		NO_2, O_3, SO_2	CO
39–44	1	.03 to .08	3 to 8.
45–50	2	.15 to .20	15 to 20.
51–56	3	.40 to .45	40 to 45.
57–62	4	.80 to .90	80 to 90.

Block No.	Description
39–41, 45–47, 51–53, 57–59	*Lower Probability Limits, Accuracy:* Blocks 39, 45, 51 and 57 are either "+" or "−". Blocks 40–41, 46–47, 52–53 and 58–57 contain the percentages obtained from equation 7.
42–44, 48–50, 54–56, 60–62	*Upper Probability Limit, Accuracy:* Blocks 42, 48, 54 and 60 are either "+" or "−". Blocks 43–44, 49–50, 55–56 and 61–62 contain the percentage obtained from equation 6. NOTE: If only one audit is performed during a given quarter for a given pollutant, it is not possible to calculate probability limits for that quarter. In that case, blocks 39–62 are left blank for the first such quarter and the number 001 is reported in blocks 36–38. Probability limits are then computed and reported on a semi-annual basis (i.e., after the next quarter) from the audit data obtained during the two consecutive quarters.

Manual Methods (Form 1, Back)	
9–14	*Pollutant Identifiers:* Precoded
30–35	(Rows labeled "D" are available for future additional pollutants.)
15–17	*Number of Samplers:* Count only the number of samplers for each pollutant that is associated with an approved method and from which monitoring data are reported as part of a SLAMS network.
18–19	*Number of Collocated Sites:* Number of sites having collocated samplers. The minimum number is 2.
20–23	*Number of Collocated Samples Below the Limit:* Count the number of samples from the collocated sites where the measurements from sampler reporting air quality for the site (see section 3.2.1) are below the following limits: TSP—20 μg TSP/m^3 SO_2—40 μg SO_2/m^3 NO_2—30 μg NO_2/m^3
24–26	*Lower Probability Limit, Precision:* Block 24 is either "+" or "−". Blocks 25–26 contain the percentage obtained from equation 11.
27–29	*Upper Probability Limit, Precision:* Block 27 is either "+" or "−". Blocks 28–29 contain the percentage obtained from equation 10. Note: If precision limits exceed two digits, e.g., 103%, report as 99.
36	*Type of Sampler:* Code from note 2 on the form. Codes A and B are intended for use with TSP to indicate whether or not samplers are equipped with automatic flow control. Code C is intended for use with SO_2 and NO_2 methods to indicate that flow control is accomplished with critical orifice.
37–39	*Number of Audits:* Count the total number of audits performed on the *entire network* for the pollutants. A single audit may consist of several audit level checks, but count only once for each audit. For example, although an audit conducted for NO_2 or SO_2 consists of checks at three different concentration levels, count this as one audit, not three.
40–57	*Probability Limits, Accuracy:* The lower and upper probability limits for each level of the accuracy audits are entered in blocks 40–57. Levels, their corresponding concentration ranges and the appropriate blocks for this information are given in the following table:

Blocks	Levels	Audit Concentrations	
		TSP cfm	SO_2, NO_2, μg/ml
40–45	1	.....	0.2 to 0.3.
46–51	2	One within 40–60 cfm.	0.5 to 0.6.
52–57	3	.....	0.8 to 0.9.

Block No.	Description
40–42, 46–48, 52–54	*Lower Probability Limits, Accuracy:* Blocks 40, 46 and 52 are either "+" or "−". Blocks 41–42, 47–48 and 53–54 contain the percentage obtained from equation 7.
43–45, 49–51, 55–57	*Upper Probability Limits, Accuracy:* Blocks 43, 49 and 55 are either "+" or "−". Blocks 44–45, 50–51 and 56–57 contain the percentage obtained from equation 6. Note: If accuracy limits exceed two digits, e.g., 103%, report as *99*. Report, as required, all pollutants (TSP, SO_2 and NO_2) as determined by manual sampling methods. Note that only blocks 46–51 are used for TSP. NOTE: If only one audit is performed during a given quarter for a given pollutant, it is not possible to calculate probability limits for that quarter. In that case, blocks 40–57 are left blank for the first such quarter and the number 001 is reported in blocks 37–39. Probability limits are then computed and reported on a semi-annual basis (i.e., after the next quarter) from the audit data obtained during the two consecutive quarters.

References

1. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I—Principles." EPA–600/9–76–005. March 1976. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD–77), Research Triangle Park, N.C. 27711.

2. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II—Ambient Air Specific Methods." EPA–600/4–77–027a, May 1977. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD–77), Research Triangle Park, N.C. 27711.

3. "Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Air Pollution Analyzers," (Protocol No. 2), June 1978. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch, (MD–77), Research Triangle Park, N.C. 27711.

4. "Transfer Standards for Calibration of Ambient Air Monitoring Analyzers for Ozone," June 1978. Available from U.S. Environmental Protection Agency, Department E (MD–77), Research Triangle Park, N.C. 27711.

5. "List of Reference and Equivalent Methods." Available from U.S. Environmental Protection Agency, Department E (MD–77), Research Triangle Park, N.C. 27711.

6. "Criteria, Procedures and Forms for the Evaluation of Ambient Air Monitoring Programs—Laboratory and Field," June 1979. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD–77), Research Triangle Park, N.C. 27711.

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DATA ASSESSMENT REPORT

STATE | REPORTING ORGANIZATION | YEAR | QUARTER | SEND COMPLETED FORM TO REGIONAL OFFICE ... COPY TO EMSL RTP

[ ][ ] [ ][ ] [ ] [ ]

1 2 3 4 5 6 7 8

NAME OF REPORTING ORGANIZATION _____

AUTOMATED ANALYZERS

PRECISION

		NO. OF ANALYZERS [1]	NO. OF PRECISION CHECKS	PROBABILITY LIMITS (LOWER, UPPER)
A	CO	C 4 2 1 0 1 (9-14)	(15-17)	(18-21)	(22-27)
B	NO_2	C 4 2 6 0 2 (9-14)	(15-17)	(18-21)	(22-27)
C	O_3	C 4 4 2 0 1 (9-14)	(15-17)	(18-21)	(22-27)
D	SO_2	C 4 2 4 0 1 (9-14)	(15-17)	(18-21)	(22-27)
E	___	(9-14)	(15-17)	(18-21)	(22-27)

ACCURACY

		SOURCE OF AUDIT GAS [2]	NO. OF AUDITS	PROBABILITY LIMITS (LOWER, UPPER) LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
A	CO	C 4 2 1 0 1 (28-33)	(34-35)	(36-38)	(39-44)	(45-50)	(51-56)	(57-62)
B	NO_2	C 4 2 6 0 2 (28-33)	(34-35)	(36-38)	(39-44)	(45-50)	(51-56)	(57-62)
C	O_3	C 4 4 2 0 1 (28-33)	(34-35)	(36-38)	(39-44)	(46-50)	(51-56)	(57-62)
D	SO_2	C 4 2 4 0 1 (28-33)	(34-35)	(36-38)	(39-44)	(45-50)	(51-56)	(57-62)
E	___	C (28-33)	(34-35)	(36-38)	(39-44)	(45-50)	(51-56)	(57-62)

[1] COUNT ONLY REFERENCE OR EQUIVALENT MONITORING METHODS

[2] CODE USING THE FOLLOWING:

A. NBS SUPPLIED SRM
B. EMSL REFERENCE GAS
C. OTHER (IDENTIFY VENDOR) CO
D. OTHER (IDENTIFY VENDOR) NO_2
E. OTHER (IDENTIFY VENDOR) O_3
F. OTHER (IDENTIFY VENDOR) SO_2

DATA ASSESSMENT REPORT

STATE | REPORTING ORGANIZATION | YEAR | QUARTER | SEND COMPLETED FORM TO REGIONAL OFFICE WITH COPY TO EMSL/RTP

1 2 | 3 4 5 | 6 7 | 8

NAME OF REPORTING ORGANIZATION _____

MANUAL METHODS

PRECISION

		NO. OF SAMPLERS [1]	NO. OF COLLOCATED SITES	NO. OF COLLOCATED SAMPLES < LIMIT	PROBABILITY LIMITS LOWER	PROBABILITY LIMITS UPPER
A. TSP	9-14: 1 1 1 1 0 1	15-17	18-19	20-23	24-29 +/-	24-29 +/-
B. SO_2	9-14: 1 4 2 4 0 1	15-17	18-19	20-23	24-29 +/-	24-29 +/-
C. NO_2	9-14: 1 4 2 6 0 2	15-17	18-19	20-23	24-29 +/-	24-29 +/-
D.	9-14: 1	15-17	18-19	20-23	24-29 +/-	24-29 +/-

LIMITS APPLICABLE TO BLOCKS 20-23

TSP: 20 μg TSP/m^3

SO_2: 40 μg SO_2/m^3

NO_2: 30 μg NO_2/m^3

ACCURACY

		TYPE OF SAMPLER [2]	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 LOWER	LEVEL 1 UPPER	LEVEL 2 LOWER	LEVEL 2 UPPER	LEVEL 3 LOWER	LEVEL 3 UPPER
A. TSP	30-35: 1 1 1 1 0 1	36	37-39	40-45 +/-	40-45 +/-	46-51 +/-	46-51 +/-	52-57 +/-	52-57 +/-
B. SO_2	30-35: 1 4 2 4 0 1	36	37-39	40-45 +/-	40-45 +/-	46-51 +/-	46-51 +/-	52-57 +/-	52-57 +/-
C. NO_2	30-35: 1 4 2 6 0 2	36	37-39	40-45 +/-	40-45 +/-	46-51 +/-	46-51 +/-	52-57 +/-	52-57 +/-
D.	30-35: 1	36	37-39	40-45 +/-	40-45 +/-	46-51 +/-	46-51 +/-	52-57 +/-	52-57 +/-

[1] COUNT ONLY REFERENCE OR EQUIVALENT MONITORING METHODS.

[2] CODE USING THE FOLLOWING.

A WITH AUTOMATIC FLOW CONTROL
B WITHOUT AUTOMATIC FLOW CONTROL
C WITH CRITICAL ORIFICE FLOW CONTROL

BILLING CODE 6560-01-C

FIGURE 1 FORM 1 (BACK)

Appendix B. Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring

1. General Information

This Appendix specifies the minimum quality assurance requirements of an organization operating a network of PSD stations. These requirements are regarded as the mimimum necessary for the control and assessment of the quality of the PSD ambient air monitoring data submitted to EPA. Organizations are encouraged to develop and implement quality assurance programs more extensive than the minimum required or to continue such programs where they already exist.

Quality assurance consists of two distinct and equally important functions. One function is the assessment of the quality of the monitoring data by estimating their precision and accuracy. The other function is the control, and improvement, of the quality of the monitoring data by implementation of quality control policies, procedures and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable.

In order to provide uniformity in the assessment and reporting of data quality, the assessment procedures are specified explicitly in sections 3, 4, 5 and 6 of this Appendix.

In contrast, the control and corrective action function encompasses a variety of policies, procedures, specifications, standards, and corrective measures which have varying effects on the resulting data quality. The selection and degree of specific control measures and corrective actions used depend on a number of factors such as the monitoring methods and equipment used, field and laboratory conditions, the objectives of the monitoring, the level of data quality needed, the expertise of personnel, the cost of control procedures, pollutant concentration levels, etc. Accordingly, quality control requirements are specified in general terms, in section 2 of this Appendix, to allow each organization to develop a quality control system which is most effective for its own circumstances.

For purposes of this Appendix "organization" is defined as a source owner/operator, a government agency, or their contractor which operates an ambient air pollution monitoring network for PSD purposes.

2. Quality Control Requirements

2.1 Each organization must develop and implement a quality control program consisting of policies, procedures, specifications, standards and documentation necessary to:

(1) Meet the monitoring objectives and quality assurance requirements of the permit granting authority.

(2) Minimize loss of air quality data due to malfunctions or out-of-control conditions.

The quality control program must be described in detail, suitably documented, and approved by the permit granting authority.

2.2 Primary guidance for developing the quality control program is contained in references 1 and 2, which also contain many suggested procedures, checks, and control specifications. Method specific quality control checks and specifications for manual methods are included in the respective reference methods described in Part 50 of this chapter, or in the respective equivalent method descriptions available from EPA (see reference 5). Similarly, quality control procedures related to specifically designated reference and equivalent analyzers are contained in their respective operation and instruction manuals. This guidance, and any other pertinent information from appropriate sources, should be used by organizations in developing their quality control programs.

As a minimum each quality control program must have operational procedures for each of the following activities:

(1) Selection of methods, analyzers, or samplers.

(2) Installation of equipment.

(3) Calibration.

(4) Zero and span checks and adjustments of automated analyzers.

(5) Control checks and their frequency.

(6) Control limits for zero, span and other control checks, and respective corrective actions when such limits are surpassed.

(7) Calibration and zero/span checks for multiple range analyzers.

(8) Preventive and remedial maintenance.

(9) Recording and validating data.

(10) Documentation of quality control information.

2.3 *Pollutant Standards.*

2.3.1 Gaseous standards (permeation tubes, permeation devices or cylinders of compressed gas) used to obtain test concentrations for CO, SO_2, and NO_2 must be working standards certified by comparison to a National Bureau of Standards (NBS) gaseous Standard Reference Material (SRM). A traceability protocol for certifying a working standard by direct comparison to an NBS SRM is given in reference 3. Direct use of an NBS SRM as a working standard is not prohibited but is discouraged because of the limited supply and expense of NBS SRM's.

2.3.2 Test concentrations for ozone must be obtained in accordance with the UV photometric calibration procedure specified in Appendix D of Part 50 of this chapter, or by means of an ozone transfer standard which has been certified. Consult reference 4 for guidance on ozone transfer standards.

2.3.3. Flow measurements must be made by a flow measuring instrument which is traceable to an authoritative volume or other standard.

2.4 Performance and System Audit Programs

The organization operating a PSD monitoring network must participate in EPA's national performance audit program. The permit granting authority, or EPA, may conduct system audits of the ambient air monitoring programs of organizations operating PSD networks. See section 1.4.16 of reference 1 and reference 6 for additional information about these programs. Organizations should contact either the appropriate EPA Regional Quality Control Coordinator or the Quality Assurance Branch, EMSL/RTP, at the address given in reference 3 for instructions for participation.

3. Data Quality Assessment Requirements

3.1 *Precision of Automated Methods.*

A one-point precision check must be carried out at least once every two weeks on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.08 and 0.10 ppm for SO_2, NO_2 and O_3 analyzers, and between 8 and 10 ppm for CO analyzers. The standards from which precision check test concentrations are obtained must meet the specifications of section 2.3. Except for certain CO analyzers described below, analyzers must operate in their normal sampling mode during the precision check, and the test atmosphere must pass through all filters, scrubbers, conditioners, and other components used during normal ambient sampling and as much of the ambient air inlet system as is practicable. If permitted by the associated operation or instruction manual, a CO analyzer may be temporarily modified during the precision check to reduce vent or purge flows, or the test atmosphere may enter the analyzer at a point other than the normal sample inlet, *provided that* the analyzer's response is not likely to be altered by these deviations from the normal operational mode.

If a precision check is made in conjunction with zero/span adjustment, it must be made prior to such zero and span adjustments. The difference between the actual concentration of the precision check gas and the concentration indicated by the analyzer is used to assess the precision of the monitoring data as described in section 4.1. Report data only from automated analyzers that are approved for use in the PSD network.

3.2 *Accuracy of Automated Methods.*

Each sampling quarter audit each analyzer that monitors for SO_2, NO_2, O_3 or CO at least once. The audit is made by challenging the analyzer with at least one audit gas of known concentration from each of the following range which fall within the measurement range of the analyzer being audited:

	Concentration Range, ppm	
Audit Point	SO_2, NO_2, O_3	CO
1	0.03–0.08	3–8
2	0.15–0.20	15–20
3	0.40–0.45	40–45
4	0.80–0.90	80–90

The standards from which audit gas test concentrations are obtained must meet the specifications of section 2.3. Working and transfer standards and equipment used for auditing must be different from the standards and equipment used for calibration and spanning. The auditing standards and calibration standards may be referenced to the same NBS SRM or primary UV photometer. The auditor must not be the operator/analyst who conducts the routine monitoring, calibration and analysis.

The audit shall be carried out by allowing the analyzer to analyze an audit test

atmosphere in the same manner as described for precision checks in section 3.1. The exception given in section 3.1 for certain CO analyzers does not apply for audits.

The difference between the actual concentration of the audit test gas and the concentration indicated by the analyzer is used to assess the accuracy of the monitoring data as described in section 4.2. Report data only from automated analyzers that are approved for use in the PSD network.

3.3 *Precision of Manual Methods.*

3.3.1 *TSP Method.* For a given organization's monitoring network, one sampling site must have collocated samplers. A site with the highest expected 24-hour pollutant concentration must be selected. The two samplers must be within 4 meters of each other but at least 2 meters apart to preclude airflow interference. Calibration, sampling and analysis must be the same for both collocated samplers as well as for all other samplers in the network. The collocated samplers must be operated as a minimum every third day when continuous sampling is used. When a less frequent sample schedule is used, the collocated samplers must be operated at least once each week. For each pair of collocated samplers, designate one sampler as the sampler which will be used to report air quality for the site and designate the other as the duplicate sampler. The differences in measured concentration ($\mu g/m^3$) between the two collocated samplers are used to calculate precision as described in section 5.1.

3.4 *Accuracy of Manual Methods.*

3.4.1 *TSP Method.* Each sampling quarter audit the flow rate of each high-volume sampler at least once. Audit the flow rate at one flow rate using a reference flow device described in section 2.2.8, pages 3–5, of reference 2, or a similar transfer flow standard. The device used for auditing must be different from the one used to calibrate the flow of the high-volume sampler being audited. The auditing device and the calibration device may both be referenced to the same primary flow standard. With the audit device and a normal glass fiber filter in place, operate the high-volume sampler at its normal flow rate. The difference in flow rate (in m^3/min) between the audit flow measurement and the flow indicated by the sampler's normal flow indicator are used to calculate accuracy as described in section 5.2.

Great care must be used in auditing high-volume samplers having flow regulators because the introduction of resistance plates in the audit device can cause abnormal flow patterns at the point of flow sensing. for this reason, the orfice of the flow audit device should be used without resistance plates in auditing flow regulated high-volume samplers, or other steps should be taken to assure that flow patterns are not perturbed at the point of flow sensing.

4. Calculations for Automated Methods

4.1 *Single Analyzer Precision.*

Each organization, at the end of each sampling quarter, shall calculate and report a precision probability interval for each analyzer. Directions for calculations are given below and directions for reporting are given in section 6. If monitoring data are invalidated during the period represented by a given precision check, the results of that precision check shall be excluded from the calculations. Calculate the percentage difference (d_i) for each precision check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \quad (1)$$

where:

Y_i = analyzer's indicated concentration from the i-th precision check

X_i = known concentration of the test gas used for the i-th precision check.

For each instrument, calculate the quarterly average (a_j), equation 2, and the standard deviation (S_j), equation 3.

$$\bar{a}_j = \frac{1}{n}\sum_{i=1}^{n} d_i \quad (2)$$

$$S_j = \sqrt{\frac{1}{n-1}\left[\sum_{i=1}^{n} d_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} d_i\right)^2\right]} \quad (3)$$

where n is the numnber of precision checks on the instrument made during ther sampling quarter. For example, n should be 6 or 7 if span checks are made biweekly during a quarter.

Calculate the 95 percent probability limits for precision using equation 4 and 5.

Upper 95 Percent Probability Limit = $d_j + 1.96\ S_j$ (4)

Lower 95 Percent Probability Limit = $a_j - 1.96\ S_j$ (5)

4.2 *Single Analyzer Accuracy.*

Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each audit concentration for each analyzer audited during the quarter. Directions for calculations are given below (directions for reporting are given in section 6).

Calculate and report the percentage difference (d_i) for each audit concentration using equation 1 where Y_i is the analyzer's indicated concentration from the i-th audit check and X_i is the known concentration of the audit gas used for the i-th audit check.

5. Calculations For Manual Methods

5.1 *Single Instrument Precision for TSP.*

Estimates of precision for ambient air quality measurements from the TSP method are calculated from results obtained from the collocation of two samplers at one sampling site as described in section 3.3.1. At the end of each sampling quarter calculate and report a precision probability interval using weekly collocation sampler results. Directions for calculation are given below and directions for reporting are given in section 6.

For the paired measurements described in section 3.3.1, calculate the percentage difference (d_i), using equation 1 where Y_i is the TSP concentration measured by the duplicate sampler and X_i is the TSP concentration measured by the sampler reporting air quality for the site. Calculate the quarterly average percentage difference (d_j), equation 2, standard deviation (S_j), equation 3, and upper and lower 95 percent probability limits for precision (equations 6 and 7).

Upper 95 Percent Probability Limit = $d_j + 1.96\ S_j/\sqrt{2}$ (6)

Lower 95 Percent Probability Limit = $d_j - 1.96\ S_j/\sqrt{2}$ (7)

5.2 *Single Instrument Accuracy for TSP.*

Each organization, at the end of each sampling quarter, shall calculate and report the percentage difference for each high-volume sampler audited during the quarter. Directions for calculation are given below and directions for reporting are given in section 6.

For the flow rate audit described in section 3.4, let X_i represent the known flow rate and Y_i represent the indicated flow rate. Calculate the percentage difference (d_i) using equation 1.

6. Organization Reporting Requirements

At the end of each sampling quarter, the organization must report the following data, assessment information: (1) For automated analyzers—precision probability limits from section 4.1 and percentage differences from section 4.2, and (2) For manual methods—precision probability limits from section 5.1 and percentage differences from section 5.2.

The quarterly precision and accuracy information must be submitted with the air monitoring data. All data used to calculate reported estimates of precision and accuracy including span checks, collocated sampler and audit results must be made available to the permit granting authority upon request.

References

1. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I—Principles." EPA–600/9–76–005, March 1976. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD–77), Research Triangle Park, North Carolina 27711.

2. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II—Ambient Air Specific Methods." EPA–600/4–77–027a, May 1977. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD–77), Research Triangle Park, North Carolina 27711.

3. "Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Air Pollution Analyzers." (Protocol No. 2), June 1978. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD–77), Research Triangle Park, North Carolina 27711.

4. "Transfer Standards for Calibration of Ambient Air Monitoring Analyzers for Ozone," June 1978. Available from U.S. Environmental Protection Agency, Department E (MD–77), Research Triangle Park, North Carolina 27711.

5. "List of Reference and Equivalent Methods." Available from U.S. Environmental Protection Agency, Department E (MD–77), Research Triangle Park, North Carolina 27711.

6. "Criteria, Procedures, and Forms for the Evaluation of Ambient Air Monitoring Programs—Laboratory and Field," June 1978. Available from U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD–77), Research Triangle Park, North Carolina 27711.

Appendix C—Ambient Air Quality Monitoring Methodology

1.0 Purpose

This appendix specifies the monitoring methods (manual methods or automated analyzers) which must be used in State ambient air quality monitoring stations.

2.0 State And Local Air Monitoring Stations (SLAMS)

2.1 Except as otherwise provided in this appendix, a monitoring method used in a SLAMS must be a reference or equivalent method as defined in § 50.1 of this chapter.

2.2 The following provisions under this subsection (2.2) apply to analyzers not covered by a current reference or equivalent method designation.

2.2.1 Any analyzer for SO_2, CO, or O_3 purchased before February 18, 1976, may be used in a SLAMS until February 18, 1980.

2.2.2 Any analyzer for NO_2 purchased before January 3, 1978, may be used in a SLAMS until January 3, 1980.

2.3 Any manual method or analyzer purchased prior to cancellation of its reference or equivalent method designation under § 53.11 or § 53.16 of this chapter may be used in a SLAMS following cancellation for a reasonable period of time to be determined by the Administrator.

2.4 Use of Nonconforming Analyzers in Certain Geographical Areas.

2.4.1 The State may use an analyzer that is not a reference or equivalent method in a SLAMS in a particular geographical area if the analyzer was purchased prior to February 18, 1975, and the Administrator determines:

2.4.1.1 That the analyzer (or the method of which the analyzer is representative) meets all the requirements of Part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except: (A) the test for interference equivalent specified in § 53.23(d) of this chapter, and (B) requirements of Subpart C of Part 53 of this chapter, if applicable, to the extent that failure to meet the Subpart C requirements results from sensitivity to interferants; and

2.4.1.2 That interferants that cause or would cause the analyzer to fail the requirements of § 53.23(d) and Subpart C of Part 53 of this chapter do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed. For purposes of this section (2.4), a "significant concentration" means one that would cause a measurement error equal to or greater than the lower detectable limit specification in Table B–1 in Subpart B of Part 53 of this chapter.

2.4.2 Requests for approval under this section (2.4) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.4.2.1 The date on which the analyzer was purchased;

2.4.2.2 An identification and description of the geographical area in which use of the analyzer is proposed;

2.4.2.3 Such data or other information as may be necessary to demonstrate that the interferants referred to in subsection 2.4.1.2 do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed; and

2.4.2.4 Test data for tests conducted with the analyzer in accordance with Subpart C of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed, if Subpart C would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative.

2.4.3 Any person who has obtained approval of a request under this section (2.4) shall:

2.4.3.1 Assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request;

2.4.3.2 Report to the Administrator within 60 days any significant increase in concentrations of the interferants referred to in subsection 2.4.1.2 in the geographical area identified in the request and concurrently submit such new or additional information as may be necessary to supplement the demonstration required by subsection 2.4.2.3; and

2.4.3.3 On a semi-annual basis, submit reports containing such data or other information as may be necessary to demonstrate that the interferants referred to in subsection 2.4.1.2 continue to occur in insignificant concentrations in the geographical area identified in the request. Reports required by this subsection (2.4.3) shall be submitted to the address specified in subsection 2.7.1.

2.5 Use of Methods with Nonconforming Ranges.

2.5.1 The State may use in a SLAMS an analyzer that is not a reference or equivalent method if:

2.5.1.1 The analyzer was purchased prior to February 18, 1975;

2.5.1.2 The Administrator determines that the analyzer (or the method of which the analyzer is representative) meets all requirements of Part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except the range requirement specified in Table B–1 in Subpart B of Part 53 of this chapter; and

2.5.1.3 The range of the analyzer does not extend to concentrations more than two times the upper range limit specified in such Table B–1, or, if the analyzer has more than one selectable range, the analyzer will not be used while operated in any range extending to such concentrations.

Note.—If the use of the analyzer is approved under section 2.6, the limitations specified in this subsection (2.5.1.3) will not apply unless the approval under section 2.6 is later withdrawn.

2.5.2 Requests for approval under this section (2.5) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.5.2.1 The date on which the analyzer was purchased; and

2.5.2.2 A statement that the range of the analyzer does not extend to concentrations more than two times the upper range limit specified in Table B–1 in Subpart B of Part 53 of this chapter, or, if the analyzer has more than one selectable range, that the analyzer will not be operated in any range extending to such concentrations.

Note.—If use of the analyzer is approved under section 2.6, the statements required by this subsection (2.5.2.2) will be considered inapplicable unless the approval under section 2.6 is later withdrawn.

2.5.3 Any person who has obtained approval of a request under this section (2.5) shall, if the analyzer has more than one selectable range, assure that the analyzer is not operated in any range extending to concentrations more than two times the upper range limit specified in such Table B–1.

2.6 Use of methods with higher, unapproved, or nonconforming ranges in certain geographical areas.

2.6.1 *Unapproved ranges.* Until January 1, 1983, a designated analyzer (reference or equivalent method) may be used without

special approval as required by section 2.7 while operating on a range higher (broader) than the range or ranges covered by the analyzer's designation, provided that (1) the range does not extend to concentrations more than two times the upper range limit specified in Table B–1 of Part 53 of this chapter, (2) the analyzer is located in a geographical area where the pollutant to be measured is likely to occur in concentrations higher than the range for which the analyzer is designated, and (3) the unapproved range is used only during periods when those higher concentrations are likely to occur.

2.6.2 *Nonconforming ranges.* An analyzer may be used (indefinitely) on a range which extends to concentrations higher than two times the upper limit specified in Table B–1 of Part 53 of this chapter if:

2.6.2.1 The analyzer has more than one selectable range and has been designated as a reference or equivalent method on at least one of its ranges, or has been approved for use under section 2.5 (which applies to analyzers purchased before February 18, 1975);

2.6.2.2 The pollutant intended to be measured with the analyzer is likely to occur in concentrations more than two times the upper range limit specified in Table B–1 of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.2.3 The Administrator determines that the resolution of the range or ranges for which approval is sought is adequate for its intended use. For purposes of this section (2.6), "resolution" means the ability of the analyzer to detect small changes in concentration.

2.6.3 Requests for approval under section 2.6.2 must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each request must contain the information specified in subsection 2.7.2 in addition to the following:

2.6.3.1 The range or ranges proposed to be used;

2.6.3.2 Test data, records, calculations, and test results as specified in subsection 2.7.2.2 for each range proposed to be used;

2.6.3.3 An identification and description of the geographical area in which use of the analyzer is proposed;

2.6.3.4 Data or other information demonstrating that the pollutant intended to be measured with the analyzer is likely to occur in concentrations more than two times the upper range limit specified in Table B–1 of Part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.3.5 Test data or other information demonstrating the resolution of each proposed range that is broader than that permitted by section 2.5.

2.6.4 Any person who has obtained approval of a request under this section (2.6.2) shall assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request and only while operated in the range or ranges specified in the request.

2.7 Requests for Approval; Withdrawal of Approval.

2.7.1 Requests for approval under sections 2.4, 2.5, or 2.6.2 must be submitted to: Director, Environmental Monitoring and Support Laboratory, Department E (MD 75), United States Environmental Protection Agency, Environmental Research Center, Research Triangle Park, North Carolina 27711.

2.7.2 Except as provided in subsection 2.7.3, each request must contain:

2.7.2.1 A statement identifying the analyzer (e.g., by serial number) and the method of which the analyzer is representative (e.g., by manufacturer and model number); and

2.7.2.2 Test data, records, calculations, and test results for the analyzer (or the method of which the analyzer is representative) as specified in Subpart B, Subpart C, or both (as applicable) of Part 53 of this chapter.

2.7.3 A request may concern more than one analyzer or geographical area and may incorporate by reference any data or other information known to EPA from one or more of the following:

2.7.3.1 An application for a reference or equivalent method determination submitted to EPA for the method of which the analyzer is representative, or testing conducted by the applicant or by EPA in connection with such an application;

2.7.3.2 Testing of the method of which the analyzer is representative at the initiative of the Administrator under § 53.7 of this chapter; or

2.7.3.3 A previous or concurrent request for approval submitted to EPA under this section (2.7).

2.7.4 To the extent that such incorporation by reference provides data or information required by this section (2.7) or by sections 2.4, 2.5, or 2.6, independent data or duplicative information need not be submitted.

2.7.5 After receiving a request under this section (2.7), the Administrator may request such additional testing or information or conduct such tests as may be necessary in his judgment for a decision on the request.

2.7.6 If the Administrator determines, on the basis of any information available to him, that any of the determinations or statements on which approval of a request under this section (2.7) was based are invalid or no longer valid, or that the requirements of sections 2.4, 2.5, or 2.6, as applicable, have not been met, he may withdraw the approval after affording the person who obtained the approval an opportunity to submit information and arguments opposing such action.

2.8 Modifications of Methods by Users.

2.8.1 Except as otherwise provided in this section (2.8), no reference method, equivalent method, or alternative method may be used in a SLAMS if it has been modified in a manner that will, or might, significantly alter the performance characteristics of the method without prior approval by the Administrator. For purposes of this section (2.8), "alternative method" means an analyzer the use of which has been approved under sections 2.4, 2.5, or 2.6 of this appendix or some combination thereof.

2.8.2 Requests for approval under this section (2.8) must meet the submittal requirements of sections 2.7.1 and 2.7.2.1 of this appendix.

2.8.3 Each request submitted under this section (2.8) must include:

2.8.3.1 A description, in such detail as may be appropriate, of the desired modification;

2.8.3.2 A brief statement of the purpose(s) of the modification, including any reasons for considering it necessary or advantageous;

2.8.3.3 A brief statement of belief concerning the extent to which the modification will or may affect the performance characteristics of the method; and

2.8.3.4 Such further information as may be necessary to explain and support the statements required by subsections 2.8.3.2 and 2.8.3.3.

2.8.4 Within 75 days after receiving a request for approval under this section (2.8) and such further information as he may request for purposes of his decision, the Administrator will approve or disapprove the modification in question by letter to the person or agency requesting such approval.

2.8.5 A temporary modification that will or might alter the performance characteristics of a reference, equivalent, or alternative method may be made without prior approval under this section (2.8) if the method is not functioning or is malfunctioning, provided that parts necessary for repair in accordance with the applicable operation manual cannot be obtained within 45 days. Unless such temporary modification is later approved under subsection 2.8.4, the temporarily modified method shall be repaired in accordance with the applicable operation manual as quickly as practicable but in no event later than 4 months after the temporary modification was made, unless an extension of time is granted by the Administrator. Unless and until the temporary modification is approved, air quality data obtained with the method as temporarily modified must be clearly identified as such when submitted in accordance with § 58.28 or § 58.35 of this chapter and must be accompanied by a report containing the information specified in subsection 2.8.3. A request that the Administrator approve a temporary modification may be submitted in accordance with subsections 2.8.1 through 2.8.4. In such cases the request will be considered as if a request for prior approval had been made.

3.0 National Air Monitoring Stations (NAMS)

3.1 Methods used in those SLAMS which are also designated as NAMS to measure SO_2, CO, NO_2, or O_3, must be reference or equivalent methods which have the capability of providing hourly measurements.

4.0 Particulate Matter Episode Monitoring

4.1 For short-term measurements of particulate matter during air pollution episodes (see § 51.16 of this chapter) the measurement method must be:

4.1.1 Either the "Staggered High Volume Sampling" method or the "High Volume Sampling Over Short Sampling Times" method, both of which are based on the reference method for suspended particulates and are described in reference 1; or

4.1.2 Any other method for measuring suspended particulates:

4.1.2.1 Which has a measurement range or ranges appropriate to accurately measure air pollution episode concentrations of suspended particulates,

4.1.2.2. Which has a sample period appropriate for short-term measurements, and

4.1.2.3 for which a quantitative relationship to the reference method for suspended particulates has been established at the use site. Procedures for establishing a quantitative site-specific relationship are contained in reference 1.

4.2 *Quality Assurance.* Particulate methods other than the reference method are not covered under the quality assessment requirements of Appendix A. Therefore, States must develop and implement their own quality assessment procedures for those methods allowed under this Section 4. These quality assessment procedures should be similar or analogous to those described in Section 3 of Appendix A for the particulate reference method.

5.0 References

5.1 "Guidance for Selecting TSP Episode Monitoring Methods," U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, OAQPS No. 1.2–114, February, 1979.

APPENDIX D—NETWORK DESIGN FOR STATE AND LOCAL AIR MONITORING STATIONS (SLAMS) AND NATIONAL AIR MONITORING STATIONS (NAMS)

1. SLAMS MONITORING OBJECTIVES AND SPATIAL SCALES
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1. SLAMS Monitoring Objectives and Spatial Scales

The purpose of this appendix is to describe monitoring objectives and general criteria to be applied in establishing the State and Local Air Monitoring Stations (SLAMS) networks and for choosing general locations for new monitoring stations. It also describes criteria for determining the number and location of National Air Monitoring Stations (NAMS). These criteria will also be used by EPA in evaluating the adequacy of SLAMS/NAMS networks.

The network of stations which comprise SLAMS should be designed to meet a minimum of four basic monitoring objectives. These basic monitoring objectives are: (1) To determine highest concentrations expected to occur in the area covered by the network; (2) to determine representative concentrations in areas of high population density; (3) to determine the impact on ambient pollution levels of significant sources or source categories; and (4) to determine general background concentration levels.

To a large extent, the existing State Implementation Plan (SIP) monitoring networks have been designed with these four objectives in mind. Thus, they can serve as the logical starting point for establishing the SLAMS network. This will, however, require a careful review of each existing SIP ambient network to determine the principal objectives of each station and the extent to which the location criteria presented herein are being met. It should be noted that this appendix contains no criteria for determining the total number of stations in SLAMS networks. The optimum size of a particular SLAMS network involves trade offs among data needs and available resources which EPA believes can best be resolved during the network design process.

This appendix focuses on the relationship between monitoring objectives and the geographical location of monitoring stations. Included are a rationale and set of general criteria for identifying candidate station locations in terms of physical characteristics which most closely match a specific monitoring objective. The criteria for more specifically siting the monitoring station including spacing from roadways and vertical and horizontal probe placement, are described in Appendix E of this part.

To clarify the nature of the link between general monitoring objectives and the physical location of a particular monitoring station, the concept of spatial scale of representativeness of a monitoring station is defined. The goal in siting stations is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring objective of the station.

Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring station throughout which actual pollutant concentrations are reasonably similar. The scale of representativeness of most interest for the monitoring objectives defined above are as follows:

- *Microscale*—defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- *Middle Scale*—defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
- *Neighborhood Scale*—defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.
- *Urban Scale*—defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.
- *Regional Scale*—defines usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.
- *National and Global Scales*—these measurement scales represent concentrations characterizing the nation and the globe as a whole.

Proper siting of a monitoring station requires precise specification of the monitoring objective which usually includes a desired spatial scale of representativeness. For example, consider the case where the objective is to determine maximum CO concentrations in areas where pedestrians may reasonably be exposed. Such areas would most likely be located within major street canyons of large urban areas and near traffic corridors. Stations located in these areas are most likely to have a microscale of representativeness since CO concentrations typically peak nearest roadways and decrease rapidly as the monitor is moved from the roadway. In this example, physical location was determined by consideration of CO emission patterns, pedestrian activity, and physical characteristics affecting pollutant dispersion. Thus, spatial scale of representativeness was not used in the selection process but was a *result* of station location.

In some cases, the physical location of a station is determined from joint consideration of both the basic monitoring objective, and a desired spatial scale of representativeness. For example, to determine CO concentrations which are typical over a reasonably broad geographic area having relatively high CO concentrations, a neighborhood scale station is more appropriate. Such a station would likely be located in a residential or commercial area having a high overall CO emission density but not in the immediate vicinity of any single roadway. Note that in this example, the desired scale of representativeness was an important factor in determining the physical location of the monitoring station.

In either case, classification of the station by its intended objective and spatial scale of representativeness is necessary and will aid in interpretation of the monitoring data.

Table 1 illustrates the relationship between the four basic monitoring objectives and the scales of representativeness that are generally most appropriate for that objective.

Table 1.—*Relationship among monitoring objectives and scale of representativeness*

Monitoring objective	Appropriate siting scales
Highest concentration	Micro, middle, neighborhood (sometimes urban).
Population	Neighborhood, urban.
Source impact	Micro, middle, neighborhood.
General/background	Neighborhood, regional.

Subsequent sections of this appendix describe in greater detail the most appropriate scales of representativeness and general monitoring locations for each pollutant.

2. Slams Network Design Procedures

The preceding section of this appendix has stressed the importance of defining the objectives for monitoring a particular pollutant. Since monitoring data are collected to "represent" the conditions in a section or subregion of a geographical area, the previous section included a discussion of the scale of representativeness of a monitoring station. The use of this physical basis for locating stations allows for an objective approach to network design.

The discussion of scales in Sections 2.2–2.6 does not include all of the possible scales for each pollutant. The scales which are discussed are those which are felt to be most pertinent for SLAMS network design.

In order to evaluate a monitoring network and to determine the adequacy of particular monitoring stations, it is necessary to examine each pollutant monitoring station individually by stating its monitoring objective and determining its spatial scale of representativeness. This will do more than insure compatibility among stations of the same type. It will also provide a physical basis for the interpretation and application of the data. This will help to prevent mismatches between what the data actually represent and what the data are interpreted to represent. It is important to note that SLAMS are not necessarily sufficient for completely describing air quality. In many situations, diffusion models must be applied to complement ambient monitoring, e.g., determining the impact of point sources or defining boundaries of nonattainment areas.

2.1 *Background Information for Establishing SLAMS*

Background information that must be considered in the process of selecting SLAMS from the existing network and in establishing new SLAMS includes emission inventories, climatological summaries, and local geographical characteristics. Such information is to be used as a basis for the judgmental decisions that are required during the station selection process. For new stations, the background information should be used to decide on the actual location considering the monitoring objective and spatial scale while following the detailed procedures in References 1 through 4.

Emission inventories are generally the most important type of background information needed to design the SLAMS network. The emission data provide valuable information concerning the size and distribution of large point sources. Area source emissions are usually available for counties but should be subdivided into smaller areas or grids where possible, especially if diffusion modeling is to be used as a basis for determining where stations should be located. Sometimes this must be done rather crudely, for example, on the basis of population or housing units. In general, the grids should be smaller in areas of dense population than in less densely populated regions.

Emission inventory information for point sources should be generally available for any area of the country for annual and seasonal averaging times. Specific information characterizing the emissions from large point sources for the shorter averaging times (diurnal variations, load curves, etc.) can often be obtained from the source. Area source emission data by season, although not available from the EPA, can be generated by apportioning annual totals according to degree days.

Detailed area source data are also valuable in evaluating the adequacy of an existing station in terms of whether the station has been located in the desired spatial scale of representativeness. For example, it may be the desire of an agency to have an existing CO station measuring in the neighborhood scale.

By examining the traffic data for the area and examining the physical location of the station with respect to the roadways, a determination can be made as to whether or not the station is indeed measuring the air quality on the desired scale.

The climatological summaries of greatest use are the frequency distributions of wind speed and direction. The wind rose is an easily interpreted graphical presentation of the directional frequencies. Other types of useful climatological data are also available, but generally are not as directly applicable to the site selection process as are the wind statistics.

In many cases, the meteorological data originating from the most appropriate (not necessarily the nearest) national weather service (NWS) airport station in the vicinity of the prospective siting area will adequately reflect conditions over the area of interest, at least for annual and seasonal averaging times. In developing data in complex meteorological and terrain situations, diffusion meteorologists should be consulted. NWS stations can usually provide most of the relevant weather information in support of network design activities anywhere in the country. Such information includes joint frequency distributions of winds and atmospheric stability (stability-wind roses).

The geographical material is used to determine the distribution of natural features, such as forests, rivers, lakes, and manmade features. Useful sources of such information may include road and topographical maps, aerial photographs, and even satellite photographs. This information may include the terrain and land-use setting of the prospective monitor siting area, the proximity of larger water bodies, the distribution of pollutant sources in the area, the location of NWS airport stations from which weather data may be obtained, etc. Land use and topographical characteristics of specific areas of interest can be determined from U.S. Geological Survey (USGS) maps and land use maps. Detailed information on urban physiography (building/street dimensions, etc.) can be obtained by visual observations, aerial photography, and also surveys to supplement the information available from those sources. Such information could be used in determining the location of local pollutant sources in and around the prospective station locations.

2.2 *Total Suspended Particulates (TSP) Design Criteria for SLAMS*

The first step in designing the TSP SLAMS network is to collect the necessary background information as discussed previously. For TSP monitoring purposes, emphasis on background information would be placed on regional and traffic maps and aerial photographs showing topography, settlements, major industries, and highways. These maps and photographs would be used to identify areas of the type that are of concern to the particular monitoring objective. After potentially suitable monitoring areas for TSP have been identified on a map, a model [8] may be used to provide an estimate of TSP concentrations throughout the area of interest.

The second step is to evaluate existing TSP stations which are candidates for SLAMS designation. Stations meeting one or more of the four monitoring objectives shown in Section 1, must be classified into one of four scales of representativeness (middle, neighborhood, urban, and regional) if the stations are to become SLAMS. In siting and classifying TSP stations, the procedures described in reference 1 should be used to evaluate existing stations and must be used to relocate an existing station or to locate any new SLAMS stations.

The following describes in detail the characteristics of each of the four scales relevant to TSP SLAMS.

• *Middle Scale.*—Much of the measurement of short-term public exposure to particulates is on this scale. People moving through downtown areas, or living near major roadways, encounter particulates that would be adequately characterized by observations of this spatial scale. Thus, measurements of this type would be appropriate for the evaluation of possible short-term public health effects of particulate pollution. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with indirect sources, that is, complexes that do not produce pollutants themselves but which attract a significant number of autos. Shopping centers, stadia, and office buildings are examples of indirect sources. In the case of TSP, unpaved or seldom swept parking lots associated with indirect sources could be an important source in addition to the vehicular emissions themselves.

• *Neigborhood Scale.*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregion with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to the TSP concentration, as well as the land use and land surface characteristics. In some cases, a location carefully chosen to provide neighborhood scale data would represent not only the immediate neighborhood but also neighborhoods of the same type in other parts of the city. Stations of this kind provide good information about trends and compliance with standards because they often represent conditions in

areas where people commonly live and work for periods comparable to those specified in the NAAQS. In the sense used here, this category includes industrial and commercial neighborhoods, as well as residential.

Neighborhood scale data could provide valuable information for developing, testing, and revising models that describe the larger-scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. The neighborhood scale measurements could also be used for neighborhood comparisons within or between cities. This is the most likely scale of measurement to meet the needs of planners.

• *Urban Scale.*—This class of measurement would be made to typify the particulate concentration over an entire metropolitan area. Such measurements would be useful for assessing trends in city-wide air quality, and hence, the effectiveness of large scale air pollution control strategies.

• *Regional Scale.*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditions for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas with reasonably uniform ground cover. Data characteristics of this scale would provide information about larger-scale processes of particulate emissions, losses, and transport.

2.3 *Sulfur Dioxide (SO_2) Design Criteria for SLAMS*

The spatial scales for SO_2 SLAMS monitoring are the middle, neighborhood, urban, and regional scales. Because of the nature of SO_2 distributions over urban areas, the middle scale is the most likely scale to be represented by a single measurement in an urban area, but only if the undue effects from local sources (minor or major point sources) can be eliminated. Neighborhood scales would be those most likely to be represented by single measurements in suburban areas where the concentration gradients are less steep. Urban scales would represent areas where the concentrations are uniform over a larger geographical area. Regional scale measurements would be associated with rural areas.

• *Middle Scale.*—Some data uses associated with middle scale measurements for SO_2 include assessing the effects of control strategies to reduce urban concentrations (especially for the 3-hour and 24-hour averaging times) and monitoring air pollution episodes.

• *Neighborhood Scale.*—This scale applies in areas where the SO_2 concentration gradient is relatively flat (mainly suburban areas surrounding the urban center) or in large sections of small cities and towns. In general, these areas are quite homogeneous in terms of SO_2 emission rates and population density. Thus, neighborhood scale measurements may be associated with baseline concentrations in areas of projected growth and in studies of population responses to exposure to SO_2. Also concentration maxima associated with air pollution episodes may be uniformly distributed over areas of neighborhood scale, and measurements taken within such an area would represent neighborhood, and to a limited extent, middle scale concentrations.

• *Urban Scale.*—Data from this scale could be used for the assessment of air quality trends and the effect of control strategies on urban scale air quality.

• *Regional Scale.*—These measurements would be applicable to large homogeneous areas, particularly those which are sparsely populated. Such measurements could provide information on background air quality and interregional pollutant transport.

After the spatial scale has been selected to meet the monitoring objectives for each station location, the procedures found in reference 2 should be used to evaluate the adequacy of each existing SO_2 station and must be used to relocate an existing station or to locate any new SLAMS stations. The background material for these procedures should consist of emission inventories, meteorological data, wind roses, and maps for population and topographical characteristics of specific areas of interest. Isopleth maps of SO_2 air quality as generated by diffusion models[5] are useful for the general determination of a prospective area within which the station is eventually placed.

2.4 *Carbon Monoxide (CO) Design Criteria for SLAMS*

Micro, middle, and neighborhood scale measurements are necessary station classifications for SLAMS since most people are exposed to CO concentrations in these scales. Carbon monoxide maxima occur primarily in areas near major roadways and intersections with high traffic density and poor atmospheric ventilation. As these maxima can be predicted by ambient air quality modeling, a large fixed network of CO monitors is not required. Long-term CO monitoring should be confined to a limited number of micro and neighborhood scale stations in large metropolitan areas to measure maximum pollution levels and to determine the effectiveness of control strategies.

• *Microscale.*—Measurements on this scale would represent distributions within street canyons, over sidewalks, and near major roadways. The measurements at a particular location in a street canyon would be typical of one high concentration area which can be shown to be a representation of many more areas throughout the street canyon or other similar locations in a city. This is a scale of measurement that would provide valuable information for devising and evaluating "hot spot" control measures.

• *Middle Scale.*—This category covers dimensions from 100 meters to 0.5 kilometer. In certain cases discussed below, it may apply to regions that have a total length of several kilometers. In many cases of interest, sources and land use may be reasonably homogeneous for long distances along a street, but very inhomogeneous normal to the street. This is the case with strip development and freeway corridors. Included in this category are measurements to characterize the CO concentrations along the urban features just enumerated. When a location is chosen to represent conditions in a block of street development, then the characteristic dimensions of this scale are tens of meters by hundreds of meters. If an attempt is made to characterize street-side conditions throughout the downtown area or along an extended stretch of freeway, the dimensions may be tens of meters by kilometer.

The middle scale would also include the parking lots and feeder streets associated with indirect sources which attract significant numbers of pollutant emitters, particularly autos. Shopping centers, stadia, and office buildings are examples of indirect sources.

• *Neighborhood Scale.*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregions, with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to CO concentration, but it probably also applies to land use. In some cases, a location carefully chosen to provide neighborhood scale data, might represent not only the immediate neighborhood, but also neighborhoods of the same type in other parts of the city. These kinds of stations would provide information relating to health effects because they would represent conditions in areas where people live and work. Neighborhood scale data would provide valuable information for developing, testing, and revising concepts and models that describe the larger scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. These types of measurements could also be used for interneighborhood comparisons within or between cities.

After the spatial scale has been determined to meet the monitoring objectives for each location, the location selection procedures, as shown in reference 3 should be used to evaluate the adequacy of each existing CO station and must be used to relocate an existing station or to locate any new SLAMS stations. The background material necessary for these procedures may include the average daily traffic on all streets in the area, wind roses for different hours of the day, and maps showing one-way streets, street widths, and building heights. If the station is to typify the area with the highest concentrations, the streets with the greatest daily traffic should be identified. If some streets are one-way, those streets that have the greatest traffic during the afternoon and evening hours should be selected as tentative locations, because the periods of high traffic volume are usually of greatest duration through the evening hours. However, the strength of the morning inversion has to be considered along with the traffic volume and pattern when seeking areas with the highest concentrations. Traffic counters near the stations will provide valuable data for interpreting the observed CO Concentrations.

Monitors should not be placed in the vicinity of possible anomalous source areas. Examples of such areas include toll gates on turnpikes, metered freeway ramps, and drawbridge approaches. Additional information on network design may be found in reference 3.

2.5 *Ozone (O_3) Design Criteria for SLAMS*

Ozone is not directly emitted into the atmosphere but results from complex photochemical reactions involving organic compounds, oxides of nitrogen, and solar radiation.

The relationships between primary emissions (precursors) and secondary pollutants (O_3) tend to produce large separations spatially and temporally between the major sources and the areas of high oxidant pollution. This suggests that the meteorological transport process and the relationships between sources and sinks need to be considered in the development of the network design criteria and placement of monitoring stations, especially in measuring peak concentration levels.

The principal spatial scales for SLAMS purposes based on the monitoring objectives are neighborhood, urban, regional, and to a lesser extent, middle scale. Since ozone requires appreciable formation time, the mixing of reactants and products occurs over large volumes of air, and this reduces the importance of monitoring small scale spatial variability.

• *Middle Scale.*—Measurement in this scale would represent conditions close to sources of NO_x such as roads where it would be expected that suppression of O_3 concentrations would occur. Measurements at these stations would represent conditions over relatively small portions of the urban area.

• *Neighborhood Scale.*—Measurements in this category represent conditions throughout some reasonably homogeneous urban subregion, with dimensions of a few kilometers. Homogeneity refers to pollutant concentrations. Neighborhood scale data will provide valuable information for developing, testing, and revising concepts and models that describe urban/regional concentration patterns. They will be useful to the understanding and definition of processes that take periods of hours to occur and hence involve considerable mixing and transport. Under stagnation conditions, a station located in the neighborhood scale may also experience peak concentration levels within the urban areas.

• *Urban Scale.*—Measurement in this scale will be used to estimate concentrations over large portions of an urban area with dimensions of several kilometers to 50 or more kilometers. Such measurements will be used for determining trends, and designing area-wide control strategies. The urban scale stations would also be used to measure high concentrations downwind of the area having the highest precursor emissions.

• *Regional Scale.*—This scale of measurement will be used to typify concentrations over large portions of a metropolitan area and even larger areas with dimensions of as much as hundreds of kilometers. Such measurements will be useful for assessing the ozone that is transported into an urban area. Data from such stations may be useful in accounting for the ozone that cannot be reduced by control strategies in that urban area.

The location selection procedure continues after the spatial scale is selected based on the monitoring objectives. The appropriate network design procedures as found in reference 4, should be used to evaluate the adequacy of each existing O_3 monitor and must be used to relocate an existing station or to locate any new O_3 SLAMS stations. The first step in the siting procedure would be to collect the necessary background material, which may consist of maps, emission inventories for nonmethane hydrocarbons and oxides of nitrogen (NO_x), climatological data, and existing air quality data for ozone, nonmethane hydrocarbons, and NO_x/NO.

For locating a neighborhood scale station to measure typical city concentrations, a reasonably homogeneous geographical area near the center of the region should be selected which is also removed from the influence of major NO_x sources. For an urban scale station to measure the high concentration areas, the emission inventories should be used to define the extent of the area of important nonmethane hydrocarbons and NO_x emissions. The most frequent wind speed and direction for periods of important photochemical activity should be determined. Then the prospective monitoring area should be selected in a direction from the city that is most frequently downwind during periods of photochemical activity. The distance from the station to the upwind edge of the city should be about equal to the distance traveled by air moving for 5 to 7 hours at wind speeds prevailing during periods of photochemical activity. Prospective areas for locating O_3 monitors should always be outside the area of major NO_x.

In locating a neighborhood scale station which is to measure high concentrations, the same procedures used for the urban scale are followed except that the station should be located closer to the areas bordering on the center city or slightly further downwind in an area of high density population.

For regional scale background monitoring stations, the most frequent wind associated with important photochemical activity should be determined. The prospective monitoring area should be upwind for the most frequent direction and outside the area of city influence.

Where ozone levels have significant fluctuations throughout the year, consideration should be given to monitoring ozone only during the seasons when levels above the NAAQS occur as documented by previous data. Additional discussion on the procedures for siting ozone stations may be found in reference 4.

2.6 *Nitrogen Dioxide (NO_2) Design Criteria for SLAMS*

The typical spatial scales of representativeness associated with nitrogen dioxide monitoring based on monitoring objectives are middle, neighborhood, and urban. Since nitrogen dioxide is primarily formed in the atmosphere from the oxidation of NO, large volumes of air and mixing times usually reduce the importance of monitoring on small scale spatial variability especially for long averaging times. However, there may be some situations where NO_2 measurements would be made on the middle scale for both long- and short-term averages.

• *Middle Scale.*—Measurements on this scale would cover dimensions from about 100 meters to 0.5 kilometer. These measurements would characterize the public exposure to NO_2 in populated areas. Also monitors that are located closer to roadways than the minimum distances specified in Table 3 of Appendix E of this part, would be represented by measurements on this scale.

• *Neighborhood and Urban Scales.*—The same considerations as discussed in Section 2.5 for O_3 would also apply to NO_2.

After the spatial scale is selected based on the monitoring objectives, then the siting procedures as found in reference 4 should be used to evaluate the adequacy of each existing NO_2 station and must be used to relocate an existing station or to locate any new NO_2 SLAMS stations. The siting procedures begin with collecting the background material. This background information may include the characteristics of the area and its sources under study, climatological data to determine where concentration maxima are most likely to be found, and any existing monitoring data for NO_2.

For neighborhood or urban scales, the emphasis in site selection will be in finding those areas where long-term averages are expected to be the highest. Nevertheless, it should be expected that the maximum NO_2 concentrations will occur in approximately the same locations as the maximum total oxides of nitrogen concentrations. The best course would be to locate the station somewhat further downwind beyond the expected point of maximum total oxides of nitrogen to allow more time for the formation of NO_2. The dilution of the emissions further downwind from the source should be considered along with the need for reaction time for NO_2 formation in locating stations to measure peak concentration. If dispersion is favorable, maximum concentrations may occur closer to the emission sources than the locations predicted from oxidation of NO to NO_2 alone. This will occur downwind of sources based on winter wind direction or in areas where there are high ozone concentrations and high density NO_2 emissions such as on the fringe of the central business district or further downwind. The distance and direction downwind would be based on ozone season wind patterns.

Once the major emissions areas and wind patterns are known, areas of potential maximum NO_2 levels can be determined. Nitrogen dioxide concentrations are likely to decline rather rapidly outside the urban area. Therefore, the best location for measuring NO_2 concentrations will be in neighborhoods near the edge of the city.

3. Network Design for National Air Monitoring Stations (NAMS)

The NAMS must be stations selected from the SLAMS network with emphasis given to urban and multisource areas. Areas to be monitored must be selected based on urbanized population and pollutant concentration levels. Generally, a larger number of NAMS are needed in more polluted urban and multisource areas. The network design criteria discussed below reflect these concepts. However, it should be emphasized that deviations from the NAMS

network design criteria may be necessary in a few cases. Thus, these design criteria are not a set of rigid rules but rather a guide for achieving a proper distribution of monitoring sites on a national scale.

The primary objective for NAMS is to monitor in the areas where the pollutant concentration and the population exposure are expected to be the highest consistent with the averaging time of the NAAQS. Accordingly, the NAMS fall into two categories:

Category (a): Stations located in the area(s) of expected maximum concentrations (generally neighborhood scale, except micro scale for CO and urban scale for O_3);

Category (b): Stations which combine poor air quality with a high population density but not necessarily located in an area of expected maximum concentrations (neighborhood scale, except urban scale for NO_2). Category (b) monitors would generally be representative of larger spatial scales than category (a) monitors.

For each urban area where NAMS are required, both categories of monitoring stations must be established. In the case of TSP and SO_2 if only one NAMS is needed, then category (a) must be used. The analysis and interpretation of data from NAMS should consider the distinction between these types of stations as appropriate.

The concept of NAMS is designed to provide data for national policy analyses/trends and for reporting to the public on major metropolitan areas. It is not the intent to monitor in every area where the NAAQS are violated. On the other hand, the data from SLAMS should be used primarily for nonattainment decisions/analyses in specific geographical areas. Since the NAMS are stations from the SLAMS network, station locating procedures for NAMS are part of the SLAMS network design process.

3.1 *Total Suspended Particulates (TSP) Design Criteria for NAMS*

Table 2 indicates the approximate number of permanent stations needed in urban areas to characterize national and regional TSP air quality trends and geographical patterns. The criteria require that the number of stations in areas where urban populations exceed 500,000 and concentrations exceed the primary NAAQS range from 6 to 8 but in small urban areas, no more than two stations are required. A range of monitoring stations is specified in Table 2 because sources of pollutants and local control efforts can vary from one part of the country to another and therefore, some flexibility is allowed in selecting the actual number of stations in any one locale. For those cases where more than one station is required for an urban area, there should be at least one station for category (a) and category (b) objectives as discussed in Section 3. Where three or more stations are required, the mix of category (a) and (b) stations is determined on a case-by-case basis. The actual number of NAMS and their locations must be determined by EPA Regional Offices and the State agencies subject to the approval of EPA Headquarters (OANR). The EPA Headquarters approval is necessary to insure that individual stations conform to the NAMS selection criteria and the network as a whole is sufficient in terms of number and location for purposes of national analyses.

Table 2.—*TSP National Air Monitoring Station Criteria (Approximate Number of Stations Per Area)* [a]

Population category	High concentration [b]	Medium concentration [c]	Low concentration [d]
High population, >500,000	[illegible]	[illegible]	0–2
Medium population, 100,000–500,000	[illegible]	2–4	0–2
Low population, 50,000–100,000	2–4	1–2	0

[a] Selection of urban areas and actual number of stations per area will be jointly determined by EPA and the State agency.
[b] High concentration—exceeding level of the primary NAAQS by 20 percent or more.
[c] Medium concentration—exceeding secondary NAAQS.
[d] Low concentration—less than secondary NAAQS.

The estimated number of TSP NAMS required nationwide will range from approximately 600 to 700. This range of stations is based on a statistical analysis of the data and computations of the probability of detecting certain rates of change over a specific number of years. An assumption was made that the variability of the data was 20 percent, i.e., a 95 percent confidence interval around the annual mean would be 20 percent. This assumption may be regarded as a "ballpark figure." The sampling error from an every sixth-day schedule would be roughly 10 percent so an overall variability of 20 percent may be regarded as a reasonable approximation.

For TSP, it is unlikely that the same rate of change would apply throughout the nation. Regional differences in the TSP problem make it essential that the networks also be useful for regional trend assessments. In most practical applications, trends will be assessed on the basis of 3–5 years of data to minimize the impact of meteorological influences. With 60 to 70 sites in each geographical region, there is a reasonably good chance of detecting 3-year trends of more than 2 percent per year.

Using a TSP trend network of 600–700 stations there would be a reasonable chance of determining 5-year trends of more than 3 percent per year in the medium population cities with high TSP, but less than 50/50 chance of detecting 3-year trends of less than 5 percent per year in any city. Therefore, the overall range of 600–700 TSP NAMS seems to be acceptable for the purposes of national and regional trends. The actual number of monitors in any specific area would depend on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvement or degradation. Generally, the greatest density of stations would occur in the northeastern States, where urban populations are large and where pollutant levels are high.

Generally, the worst air quality in an urban area should be used as the basis for determining the required number of TSP NAMS (see Table 2). This includes air quality levels, within populated parts of urbanized areas, that are affected by one or two point sources of particulates if the impact of the source(s) extends over a reasonably broad geographic scale (neighborhood or larger). Maximum air quality levels in remote unpopulated areas should be excluded as a basis for selecting TSP NAMS regardless of the sources affecting the concentration levels. Such remote areas are more appropriately monitored by SLAMS or SPM networks and/or characterized by diffusion model calculations as necessary.

3.2 *Sulfur Dioxide (SO_2) Design Criteria for NAMS*

As with TSP monitoring, it is desirable to have a greater number of NAMS in the more polluted and densely populated urban and multisource areas. The data in Table 3 show the approximate number of permanent stations needed in urban areas to characterize the national and regional SO_2 air quality trends and geographical patterns. These criteria require that the number of NAMS in areas where urban populations exceed 500,000 and concentrations also exceed the primary NAAQS may range from 6 to 8 and that in areas where the SO_2 problem is minor, only one or two (or no) monitors are required. For those cases where more than one station is required for an urban area, there should be at least one station for category (a) and category (b) objectives as discussed in section 3. Where three or more stations are required, the mix of category (a) and (b) stations is determined on a case-by-case basis. The actual number and location of the NAMS must be determined by EPA Regional Office and the State agency, subject to the approval of EPA headquarters (OANR).

Table 3.—*SO_2 National Air Monitoring Station Criteria (Approximate Number of Stations Per Area)* [a]

Population category	High Concentration [b]	Medium Concentration [c]	Low Concentration [d]
High population, >500,000	6–8	[illegible]	0–2
Medium population, 100,000–500,000	[illegible]	2–4	0–2
Low population, 50,000–100,000	2–4	1–2	0

[a] Selection of urban areas and actual number of stations per area will be jointly determined by EPA and the State agency.
[b] High concentration—exceeding level of the primary NAAQS.
[c] Medium concentration—exceeding 60 percent of the level of the primary or 100 percent of the secondary NAAQS.
[d] Low concentration—less than 60 percent of the level of the primary or 100 percent of the secondary NAAQS.

The estimated number of SO_2 NAMS which would be required nationwide ranges from approximately 200 to 300. This range in the number of stations is less than for TSP. This is because there are more urban areas with high TSP levels than with high SO_2 levels. Also, the background air quality levels are higher for TSP than for SO_2, and thus air quality is more sensitive to SO_2 emission changes than for TSP. Therefore, fewer NAMS are needed on a national basis for SO_2 than for TSP. The actual number of stations in any specific area depends on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvements or degradation. The greatest density of stations should be where urban

populations are large and where pollution levels are high. Fewer NAMS are necessary in the western States since concentrations are seldom above the NAAQS in their urban areas. Exceptions to this are in the areas where an expected shortage of clean fuels indicates that ambient air quality may be degraded by increased SO_2 emissions. In such cases, a minimum number of NAMS is required to provide EPA with a proper national perspective on significant changes in air quality.

Like TSP, the worst air quality in an urban area is to be used as the basis for determining the required number of SO_2 NAMS (see Table 3). This includes SO_2 air quality levels within populated parts of urbanized areas, that are affected by one or two point sources of SO_2 if the impact of the source(s) extends over a reasonably broad geographic scale (neighborhood or larger). Maximum SO_2 air quality levels in remote unpopulated areas should be excluded as a basis for selecting NAMS regardless of the sources affecting the concentration levels. Such remote areas are more appropriately monitored by SLAMS or SPM networks and/or characterized by diffusion model calculations as necessary.

3.3 *Carbon Monoxide (CO) Design Criteria for NAMS*

Information is needed on ambient CO levels in major urbanized areas where CO levels have been shown or inferred to be a significant concern. At the national level, EPA will not routinely require data from as many stations as are required for TSP, and perhaps, SO_2, since CO trend stations are principally needed to assess the overall air quality progress resulting from the emission controls required by the Federal motor vehicle control program (FMVCP).

Although State and local air programs may require extensive monitoring to document and measure the local impacts of CO emissions and emission controls, an adequate national perspective is possible with as few as two stations per major urban area. The two categories for which CO NAMS would be required are: (a) peak concentration areas such as are found around major traffic arteries and near heavily traveled streets in downtown areas (micro scale); and (b) neighborhoods where concentration exposures are significant (neighborhood scale).

The peak concentration station (micro scale) is usually found near heavily traveled downtown streets (street canyons), but could be found along major arterials (corridors), either near intersections or at low elevations which are influenced by downslope drainage patterns under low inversion conditions. The peak concentration station should be located so that it is representative of several similar source configurations in the urban area, where the general population has access. Thus, it should reflect one of many potential peak situations which occur throughout the urban area. It is recognized that this does not measure air quality which represents large geographical areas. Thus, a second type of station on the neighborhood scale is necessary to provide data representative of the high concentration levels which exist over large geographical areas.

The neighborhood station (neighborhood scale) should be located in areas with a stable, high population density, projected continuity of neighborhood character, and high traffic density. The stations should be located where no major zoning changes, new highways, or new shopping centers are being considered. The station should be where a significant CO pollution problem exists, but not be under the influence of any one line source. Rather, it should be more representative of the overall effect of the sources in a significant portion of the urban area.

Because CO is generally associated with heavy traffic and population clusters, an urbanized area with a population greater than 500,000 is the principal criterion for identifying the urban areas for which pairs of NAMS for this pollutant will be required. The criterion is based on judgment that stations in urban areas with greater than 500,000 population would provide sufficient data for national analysis and national reporting to Congress and the public. Also, it has generally been shown that major CO problems are found in areas greater than 500,000 population.

3.4 *Ozone (O_3)* Design Criteria for NAMS

The criterion for selecting locations for ozone NAMS is any urbanized area having a population of more than 200,000. This population cut off is used since the sources of hydrocarbons are both mobile and stationary and are more diverse. Also, because of local and national control strategies and the complex chemical process of ozone formation and transport, more sampling stations than for CO are needed on a national scale to better understand the ozone problem. This selection criterion is based entirely on population and will include those relatively highly populated areas where most of the oxidant precursors originate.

Each urban area will generally require only two ozone NAMS, One station would be representative of maximum ozone concentrations (category (a), urban scale) under the wind transport conditions as discussed in section 2.5. The exact location should balance local factors affecting transport and buildup of peak O_3 levels with the need to represent population exposure. The second station (category (b), neighborhood scale), should be representative of high density population areas on the fringes of the central business district along the predominant summer/fall daytime wind direction. This latter station should measure peak O_3 levels under light and variable or stagnant wind conditions. Two ozone NAMS stations will be sufficient in most urban areas since spatial gradients for ozone generally are not as sharp as for other criteria pollutants.

3.5 *Nitrogen Dioxide (NO_2) Criteria for NAMS*

Nitrogen dioxide NAMS will be required in those areas of the country which have a population greater than 1,000,000. These areas will have two NO_2 NAMS. It is felt that stations in these major metropolitan areas would provide sufficient data for a national analysis of the data, and also because NO_2 problems occur in areas of greater than 1,000,000 population.

Within urban areas requiring NAMS, two permanent monitors are sufficient. The first station (category (a) neighborhood scale) would be to measure the photochemical production of NO_2 and would best be located in that part of the urban area where the emission density of NO_x is the highest. The second station (category (b) urban scale), would be to measure the NO_2 produced from the reaction of NO with O_3 and should be downwind of the area of peak NO_x emission areas.

4. Summary

Table 4 shows by pollutant, all of the spatial scales that are applicable for SLAMS and the required spatial scales for NAMS. There may also be some situations, as discussed later in Appendix E, where additional scales may be allowed for NAMS purposes.

Spatial scale	Scales applicable for SLAMS					Scales required for NAMS				
	TSP	SO_2	CO	O_3	NO_2	TSP	SO_2	CO	O_3	NO_2
Micro			✓					✓		
Middle	✓	✓	✓	✓	✓					
Neighborhood	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Urban	✓	✓		✓	✓				✓	✓
Regional	✓	✓		✓						

5. References

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2. Ball, R. J. and G. E. Anderson. Optimum Site Exposure Criteria for SO_2 Monitoring. The Center for the Environment and Man, Inc., Hartford, CT. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Publication No. EPA–450/3–77–013. April 1977.

3. Ludwig, F. L. and J. H. S. Kealoha. Selecting Sites for Carbon Monoxide Monitoring. Stanford Research Institute, Menlo Park, CA. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Publication No. EPA–450/3–75–077. September 1975.

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5. Guideline on Air Quality Models. OAQPS, U.S. Environmental Protection Agency, Research Triangle Park, NC. OAQPS No. 1.2–080. April 1978.

Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

1. Introduction
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1. Introduction

This appendix contains probe siting criteria to be applied to ambient air quality monitors or monitor probes after the general station location has been selected based on the monitoring objectives and spatial scale of representativeness as discussed in Appendix D of this part. Adherence to these siting criteria is necessary to ensure the uniform collection of compatible and comparable air quality data.

The probe siting criteria as discussed below must be followed to the maximum extent possible. It is recognized that there may be situations when the probe siting criteria cannot be followed. If the siting criteria cannot be met, this must be thoroughly documented with a written request for a waiver which describes how and why the siting criteria differs. This documentation should help to avoid later questions about the data. Conditions under which EPA would consider an application for waiver from these siting criteria are discussed in Section 8 of this appendix.

The spatial scales of representativeness used in this appendix, i.e., micro, middle, neighborhood, urban, and regional are defined and discussed in Appendix D of this part. The pollutant specific probe siting criteria generally apply to all spatial scales except where noted otherwise. Specific siting criteria that are prefaced with a "must" are defined as a requirement and exceptions must be approved through the waiver provisions. However, siting criteria that are prefaced with a "should" are defined as a goal to meet for consistency but are not a requirement.

2. Total Suspended Particulates (TSP)

2.1 *Vertical Placement*

The most desirable height for a TSP monitor is near the breathing zone. Practical considerations such as prevention of vandalism, security, accessibility, availability of electricity, etc., require that the sampler be elevated and that a range of acceptable heights be specified. For TSP, the air intake for a TSP monitor must be located 2 to 15 meters above ground level. The lower limit was based on a compromise between ease of servicing the sampler and the desire to avoid reentrainment from dusty surfaces. The upper limit represents a compromise between the desire to have measurements which are most representative of population exposures, and the consideration for the location of existing monitors.

2.2 *Spacing from Obstructions*

If the sampler is located on a roof or other structure, then there must be a minimum of 2 meters separation from walls, parapets, penthouses, etc. No furnace or incineration flues should be nearby. This separation distance from flues is dependent on the height of the flues, type of waste or fuel burned, and quality of the fuel (ash content). For example, if the emissions from the chimney are the result of natural gas combustion, no special precautions are necessary except for the avoidance of obstructions, i.e., at least 2 meters separation.

On the other hand, if fuel oil, coal, or solid waste is burned and the stack is sufficiently short so that the plume could reasonably be expected to impact on the sampler intake a significant part of the time, other buildings/locations in the area that are free from these types of sources should be considered for sampling. Trees provide surfaces for particulate deposition and also restrict airflow. Therefore, the sampler should be placed at least 20 meters from trees.

The sampler must also be located away from obstacles such as buildings, so that the distance between obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler. Sampling stations that are located closer to obstacles than this criterion allows should not be classified as neighborhood, urban, or regional scale, since the measurements from such a station would closely represent middle scale stations. Therefore, stations not meeting the criterion should be classified as middle scale. There must also be unrestricted airflow in an arc of at least 270° around the sampler, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc.

2.3 *Spacing from Roads*

A number of studies [7,8] support the conclusion that TSP concentrations decrease with increasing height of the monitor and distance from roads. Quite high concentrations have been reported at monitors located at a low elevation close to heavily traveled roads. Moreover, monitors located close to streets are within the concentrated plume of particulate matter emitted and generated by vehicle traffic. Except for special purpose monitoring studies where the monitoring objective is to determine the impact of a single source, ambient monitors should not be located so as to measure the plume of a single source. For TSP, it is appropriate that ambient monitors be located beyond the concentrated particulate plume generated by traffic, and not so close that the roadway totally dominates the measured ambient concentration.

An analysis of various monitoring studies [9] shows that a linear relationship between sampler height and distance from roadways defines a zone where the plume generated by traffic greater than approximately 3,000 vehicles per day is diminished. Figure 1 illustrates this relationship by showing two zones where TSP SLAMS could be located. Zone A represents locations which are recommended for the neighborhood, urban and regional scales and also for most middle scale locations. Zone B represents locations which should be avoided in order to minimize undesirable roadway influences.

Because of the pronounced TSP air quality gradients generally expected near roadways, SLAMS which for certain reasons cannot be located in Zone A and are located in Zone B would be classified as having a middle scale of representativeness. NAMS must be located in Zone A, and it is recommended that most SLAMS be located in Zone A.

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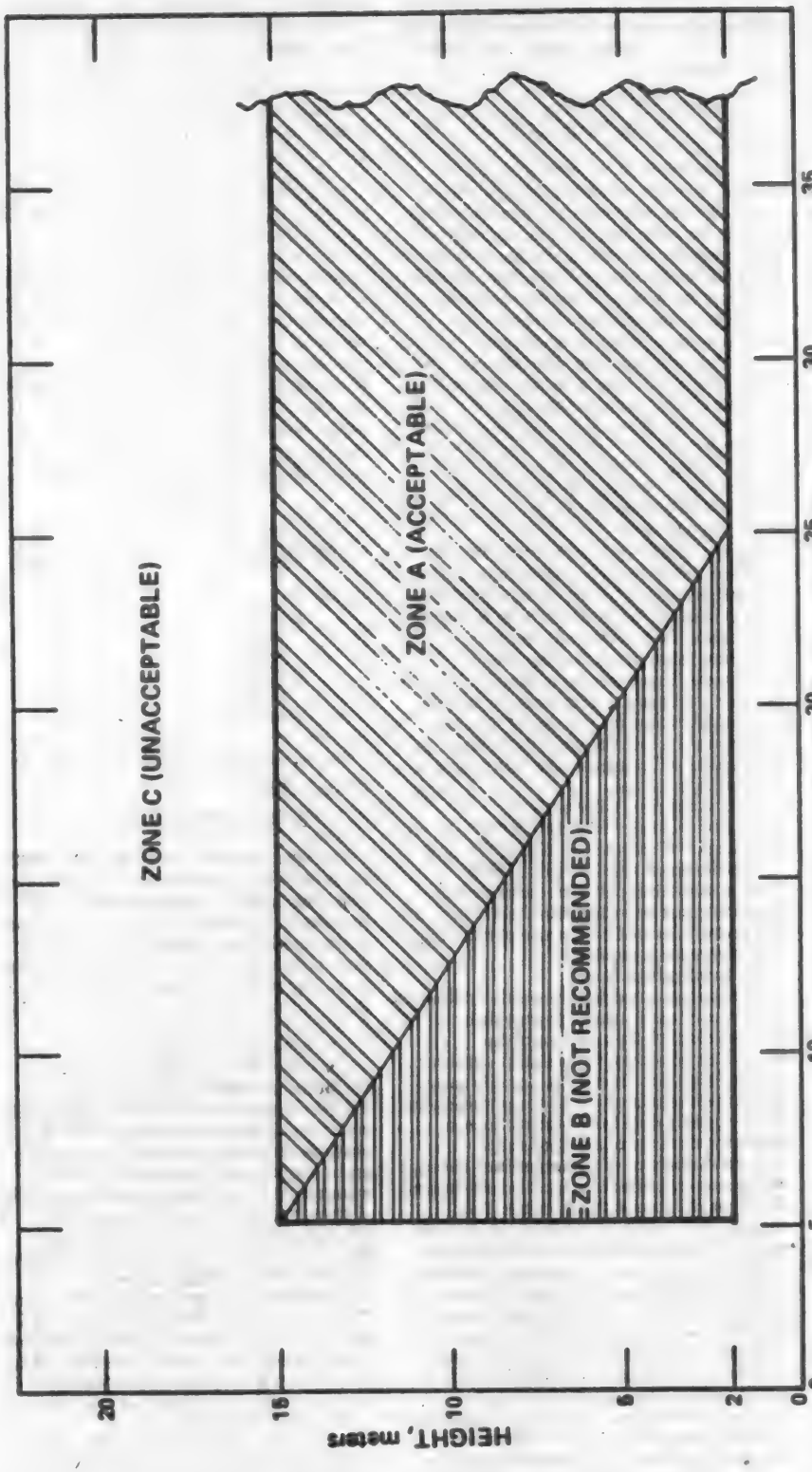

Figure I. Acceptable zone for siting TSP monitors.

In light of several street canyon studies cited above, it appears that the street canyon may confine resuspended roadway dust and may not be a suitable location for ambient monitors. However, since roads with lower traffic (less than approximately 3,000 vehicles per day) generally do not generate a concentrated particulate plume, monitors located in Zone B should not be adversely influenced. Therefore, for those cases where the traffic is less than approximately 3,000 vehicles per day, the monitor must be located greater than 5 meters from the edge of the nearest traffic lane and 2 to 15 meters above ground level (either Zone A or Zone B).

In the case of elevated roadways where the monitor must be placed below the level of the roadway, then the monitor should be located no closer than approximately 25 meters from the edge of the nearest traffic lane. This separation distance applies for those situations where the road is elevated greater than 5 meters above the ground level, and applies to all traffic volumes.

2.4 *Other Considerations*

Stations should not be located in an unpaved area unless there is vegetative ground cover year round so that the impact of reentrained or fugitive dusts will be kept to a minimum. Addtional information on TSP probe siting may be found in reference 10.

3. Sulfur Dioxide (SO_2)

3.1 *Horizontal and Vertical Probe Placement*

As with TSP monitoring, the most desirable height for an SO_2 monitor inlet probe is near the breathing height. Various factors enumerated before may require that the inlet probe be elevated. Therefore, the inlet probe must be located 3 to 15 meters above ground level. If the inlet probe is located on the side of a building, then it should be located on the windward side of the building relative to the prevailing winter wind direction. The inlet probe must also be located more than 1 meter vertically or horizontally away from any supporting structure and also away from dirty, dusty areas.

3.2 *Spacing from Obstructions*

No furnace or incineration flues, or other minor sources of SO_2 should be nearby. The separation distance is dependent on the height of the flues, type of waste or fuel burned, and the quality of the fuel (sulfur content). If the inlet probe is located on a roof or other structure, it must be at least 1 meter from walls, parapets, penthouses, etc.

The inlet probe should be placed more than 20 meters from trees and must be located away from obstacles and buildings. The distance between the obstacles and the inlet probe must be at least twice the height that the obstacle protrudes above the inlet probe. Sampling stations that are located closer to obstacles than this criterion allows should not be classified as a neighborhood scale, since the measurements from such a station would closely represent middle scale stations. Therefore, stations not meeting the criterion should be classified as middle scale. Airflow must also be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required. Additional information on SO_2 probe siting criteria may be found in reference 11.

4. Carbon Monoxide (CO)

4.1 *Horizontal and Vertical Probe Placement*

Because of the importance of measuring population exposure to CO concentrations, air should be sampled at average breathing heights. However, practical factors require that the inlet probe be higher. The required height of the inlet probe for CO monitoring is therefore 3 ± ½ meter for a microscale site, which is a compromise between representative breathing height and prevention of vandalism. The recommended 1 meter range of heights is also a compromise to some extent. For consistency and comparability, it would be desirable to have all inlets at exactly the same height, but practical considerations often prevent this. Some reasonable range must be specified and 1 meter provides adequate leeway to meet most requirements.

For the middle and neighborhood scale stations, the vertical concentration gradients are not as great as for the microscale station. This is because the diffusion from roads is greater and the concentrations would represent larger areas than for the microscale. Therefore, the required height of the inlet probe is 3 to 15 meters for middle and neighborhood scale stations. The inlet probe must be located more than 1 meter in the vertical or horizontal direction from any supporting structure.

4.2 *Spacing from Obstructions*

Airflow must also be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required.

4.3 *Spacing from Roads*

Street canyon and traffic corridor stations (microscale) are intended to provide a measurement of the influence of the immediate source on the pollution exposure of the population. In order to provide some reasonable consistency and comparability in the air quality data from such stations, a minimum distance of 2 meters and a maximum distance of 10 meters from the edge of the nearest traffic lane must be maintained for these CO monitor inlet probes. This should give consistency to the data, yet still allow flexibility of finding suitable locations.

Street canyon/corridor (microscale) inlet probes must be located at least 10 meters from an intersection and preferably at a midblock location. Midblock locations are preferable to intersection locations because intersections represent a much smaller portion of downtown space than do the streets between them. Pedestrian exposure is probably also greater in street canyon/corridors than at intersections. Finally, the practical difficulty of positioning sampling inlets is less at midblock locations than at the intersection.

In determining the minimum separation between a neighborhood scale monitoring station and a specific line source, the presumption is made that measurements should not be unduly influenced by any one roadway. Computations were made to determine the separation distances, and table 1 provides the required minimum separation distance between roadways and neighborhood scale stations. Sampling stations that are located closer to roads than this criterion allows should not be classified as a neighborhood scale, since the measurements from such a station would closely represent the middle scale. Therefore, stations not meeting this criterion should be classified as middle scale. In some cases, such a monitoring station would be acceptable for SLAMS purposes, but not NAMS since no middle scale NAMS stations are required. Additional information on CO probe siting may be found in reference 12.

Table 1.—*Minimum separation distance between neighborhood scale CO stations and roadways (edge of nearest traffic lane)*

Roadway average daily traffic, vehicles per day	Minimum separation distance between stations and roadways, meters
≤ 10,000	≥10*
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
≤ 60,000	≥150

* Distances should be interpolated based on traffic flow.

5. Ozone (O_3)

5.1 *Vertical and Horizontal Probe Placement*

The inlet probe for ozone monitors should be as close as possible to the breathing zone. The complicating factors discussed previously, however, require that the probe be elevated. The height of the inlet probe must be located 3 to 15 meters above ground level. The probe must also be located more than 1 meter vertically or horizontally away from any supporting structure.

5.2 *Spacing from Obstructions*

The probe must be located away from obstacles and buildings such that the distance between the obstacles and the inlet probe is at least twice the height that the obstacle protrudes above the sampler. The probe should also be located at least 20 meters from trees. Since the scavenging effect of trees is greater for ozone than for TSP, SO_2, CO, and NO_2, strong consideration should be used in locating the inlet probe to avoid this effect. Airflow must be unrestricted in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required.

5.3 *Spacing from Roads*

It is important in the probe siting process to minimize destructive interferences from sources of nitric oxide (NO) since NO readily reacts with ozone. Table 2 provides the required minimum separation distances

between roadways and ozone monitoring stations. These distances were based on recalculations using the methodology in reference 13 and validated using more recent ambient data collected near a major roadway. Sampling stations that are located closer to roads than this criterion allows should not be classified as neighborhood or urban scale, since the measurements from such stations would more closely represent the middle scale. Accordingly, such stations should be classified as middle scale. In some cases, a middle scale station would be acceptable for SLAMS purposes, but not for NAMS since no middle scale NAMS are required. The minimum separation distance must also be maintained between an ozone station and other similar volumes of automotive traffic, such as parking lots. Additional information on ozone probe siting criteria may be found in reference 13.

Table 2.—*Minimum separation distance between neighborhood and urban scale ozone stations and roadways (edge of nearest traffic lane)*

Roadway average daily traffic, vehicles per day	Minimum separation distance between roadways and stations, meters
≤10,000	≥10*
15,000	20
20,000	30
40,000	50
70,000	100
≥110,000	≥250

* Distances should be interpolated based on traffic flow.

6. Nitrogen Dioxide (NO_2)

6.1 *Vertical and Horizontal Probe Placement*

The height of the NO_2 inlet probe must be 3 to 15 meters above the ground. This is a compromise between measuring in the breathing zone and avoidance of vandalism, finding suitable sites, etc. For NO_2, the height does not appear to be a critical factor since the NO_2 should be fairly well mixed and somewhat uniform in the vertical direction. The distance of the inlet probe from any supporting structure must be greater than 1 meter vertically or horizontally.

6.2 *Spacing from Obstructions*

Buildings, trees, and other obstacles may possibly scavenge NO_2. In order to avoid this kind of interference, the station must be located well away from such obstacles so that the distance between obstacles and the inlet probe is at least twice the height that the obstacle protrudes above the probe. Sampling stations that are located closer to obstacles than this criterion allows should not be classified in the neighborhood or urban scales, since the measurements from such stations would more closely represent the middle scale. Such stations should be classified as middle scale. For similar reasons, a probe inlet along a vertical wall is undesirable because air moving along that wall may be subject to possible removal mechanisms. The inlet probe should also be at least 20 meters from trees. There must be unrestricted airflow in an arc of at least 270° around the inlet probe, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270° arc. If the probe is located on the side of the building, 180° clearance is required.

6.3 *Spacing from Roads*

It is important that the monitoring probe be removed from oxides of nitrogen sources to avoid measurements being dominated by any one source and to allow time for conversion (reactions) of NO emissions to NO_2. Further, the effects of roadway sources must be minimized by using separation distances for neighborhood and urban scale stations found in Table 3. These distances were based on recalculations using the methodology in reference 13 and validated using more recent ambient data collected near a major roadway. The minimum separation distance must also be maintained between an NO_2 probe and any other similar volume of automotive traffic such as parking lots. Sampling stations that are located closer to roads than this criterion allows should not generally be classified as neighborhood or urban scales, since the measurements from such stations would more closely represent middle scale stations. Such stations should generally be classified as middle scale. In some cases, such a monitoring station would be acceptable for SLAMS purposes, but not for NAMS since no middle scale NAMS are acceptable. Additional information on NO_2 probe siting criteria may be found in reference 13.

Table 3.—*Minimum separation distance between neighborhood and urban scale NO_2 stations and roadways (edge of nearest traffic lane)*

Roadway average daily traffic, vehicles per day	Minimum separation distance between roadways and station, meters
≥10,000	≥10*
15,000	20
20,000	30
40,000	50
70,000	100
≥110,000	≥250

* Distances should be interpolated based on traffic flow.

7. Probe Material and Pollutant Sample Residence Time

For the reactive gases, SO_2, NO_2, and O_3, special probe material must be used. Studies [14-18] have been conducted to determine the suitability of materials such as polypropylene, polyethylene, polyvinylchloride, tygon, aluminum, brass, stainless steel, copper, pyrex glass and teflon for use as intake sampling lines. Of the above materials, only pyrex glass and teflon have been found to be acceptable for use as intake sampling lines for all the reactive gaseous pollutants. Furthermore, EPA [19] has specified borosilicate glass or FEP teflon as the only acceptable probe materials for delivering test atmospheres in the determination of reference or equivalent methods. Therefore, borosilicate glass, FEP teflon, or their equivalent must be used for existing and new NAMS or SLAMS.

No matter how nonreactive the sampling probe material is initially, after a period of use reactive particulate matter is deposited on the probe walls. Therefore, the time it takes the gas to transfer from the probe inlet to the sampling device is also critical. Ozone in the presence of NO will show significant losses even in the most inert probe material when the residence time exceeds 20 seconds. [20] Other studies [21,22] indicate that a 10-second or less residence time is easily achievable. Therefore, sampling probes for reactive gas monitors at SLAMS or NAMS must have a sample residence time less than 20 seconds.

8. Waiver Provisions

It is believed that most sampling probes or monitors can be located so that they meet the requirements of this appendix. New stations with rare exceptions, can be located within the limits of this appendix. However, some existing stations may not meet these requirements and yet still produce useful data for some purposes. EPA will consider a written request from the State Agency to waive one or more siting criteria for some monitoring stations providing that the State can adequately demonstrate the need (purpose) for monitoring or establishing a monitoring station at that location. For establishing a new station, a waiver may be granted only if both of the following criteria are met:

- The site can be demonstrated to be as representative of the monitoring area as it would be if the siting criteria were being met.
- The monitor or probe cannot reasonably be located so as to meet the siting criteria because of physical constraints (e.g., inability to locate the required type of station the necessary distance from roadways or obstructions).

However, for an existing station, a waiver may be granted if either of the above criteria are met.

Cost benefits, historical trends, and other factors may be used to add support to the above, however, they in themselves, will not be acceptable reasons for granting a waiver. Written requests for waivers must be submitted to the Regional Administrator. For those SLAMS also designated as NAMS, the request will be forwarded to the Administrator.

9. Discussion and Summary

Table 4 presents a summary of the requirements for probe siting criteria with respect to distances and heights. It is apparent from Table 4 that different elevation distances above the ground are shown for the various pollutants. The discussion in the text for each of the pollutants described reasons for elevating the monitor or probe. The differences in the specified range of heights are based on the vertical concentration gradients. For CO, the gradients in the vertical direction are very large for the microscale, so a small range of heights has been specified. For SO_2, NO_2, TSP, and O_3 (except near roadways), the vertical gradients are smaller and thus a larger range of heights can be used. The upper limit of 15 meters was specified for consistency between pollutants and to allow the use of a single manifold for monitoring more than one pollutant.

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Table 4. Summary of probe siting criteria

Pollutant	Scale	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
			Vertical	Horizontal[a]	
TSP	All	2 - 15	—	> 2	1. Should be >20 meters from trees. 2. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler.[b] 3. Must have unrestricted airflow 270° around the sampler. 4. No furnace or incineration flues should be nearby.[c] 5. Must have minimum spacing from roads. This varies with height of monitor and spatial scale (see Figure 1).
SO_2	All	3 - 15	> 1	> 1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe.[b] 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. No furnace or incineration flues should be nearby.[c]
CO	Micro	3 ± 1/2	> 1	> 1	1. Must be >10 meters from intersection and should be at a midblock location. 2. Must be 2-10 meters from edge of nearest traffic lane. 3. Must have unrestricted airflow 180° around the inlet probe.
	Middle Neighborhood	3 - 15	> 1	> 1	1. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 2. Spacing from roads varies with traffic (see Table 1).
O_3	All	3 - 15	> 1	> 1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic (see Table 2).
NO_2	All	3 - 15	> 1	> 1	1. Should be >20 meters from trees. 2. Distance from inlet probe to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the inlet probe.[b] 3. Must have unrestricted airflow 270° around the inlet probe, or 180° if probe is on the side of a building. 4. Spacing from roads varies with traffic (see Table 3).

[a] When probe is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.

[b] Sites not meeting this criterion would be classified as middle scale (see text).

[c] Distance is dependent on height of furnace or incineration flue, type of fuel or waste burned, and quality of fuel (sulfur and ash content). This is to avoid undue influences from minor pollutant sources.

BILLING CODE 6560-01-C

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Appendix F—Annual Slams Air Quality Information

1. General
2. Required information
2.1 Sulfur Dioxide (SO_2)
2.1.1 Site and Monitoring Information
2.1.2 Annual Summary Statistics
2.2 Particulates (TSP)
2.2.1 Site and Monitoring Information
2.2.2 Annual Summary Statistics
2.3 Carbon Monoxide (CO)
2.3.1 Site and Monitoring Information
2.3.2 Annual Summary Statistics
2.4 Nitrogen Dioxide (NO_2)
2.4.1 Site and Monitoring Information
2.4.2 Annual Summary Statistics
2.5 Ozone(O_3)
2.5.1 Site and Monitoring Information
2.5.2 Annual Summary Statistics

1. *General*

This appendix describes information to be compiled and submitted annually to EPA for each ambient monitoring station in the SLAMS Network in accordance with § 58.26. The annual summary statistics that are described in section 2 below shall be construed as only the minimum necessary statistics needed by EPA to overview national air quality status. They will be used by EPA to convey information to a variety of interested parties including environmental groups, Federal agencies, the Congress, and private citizens upon request. As the need arises, EPA may issue modifications to these minimum requirements to reflect changes in EPA policy concerning the National Ambient Air Quality Standards (NAAQS).

As indicated in § 58.26(c), the contents of the SLAMS annual report shall be certified by the senior air pollution control officer in the State to be accurate to the best of his knowledge. In addition, the manner in which the data were collected must be certified to have conformed to the applicable quality assurance, air monitoring methodology, and probe siting criteria given in Appendices A, C, and E to this part. A certified statement to this effect must be included with the annual report. As required by § 58.26(a), the report must be submitted by July 1 of each year for data collected during the period January 1 to December 31 of the previous year.

EPA recognizes that most air pollution control agencies routinely publish air quality statistical summaries and interpretive reports. EPA encourages State and local agencies to continue publication of such reports and recommends that they be expanded, where appropriate, to include analysis of air quality trends, population exposure, and pollutant distributions. At their discretion, State and local agencies may wish to integrate the SLAMS report into routine agency publications.

2. *Required Information*

This paragraph describes air quality monitoring information and summary statistics which must be included in the SLAMS annual report. The required information is itemized below by pollutant. Throughout this appendix, the time of occurrence refers to the ending hour. For example, the ending hour of an 8-hour CO average from 12:01 a.m. to 8:00 a.m. would be 8:00 a.m.

2.1 *Sulfur Dioxide* (SO_2)

2.1.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations. (*1*) Number of daily observations. (*2*)

2.1.2 *Annual Summary Statistics.* Annual arithmetic mean (ppm). Highest and second highest 24-hour averages (*3*) (ppm) and dates of occurrence. Highest and second highest 3-hour averages (*1, 3*) (ppm) and dates and times (*1*) (ending hour) of occurrence. Number of exceedances of the 24-hour primary NAAQS. (*3*) Number of exceedances of the 3-hour secondary NAAQS. (*3*) Number of 24-hour average concentrations (*4*) in ranges:

Range:	Number of values
0.00 to 0.04 (ppm)	
0.05 to 0.08	
0.09 to 0.12	
0.13 to 0.16	
0.17 to 0.20	
0.21 to 0.24	
0.25 to 0.28	
Greater than .28	

2.2 *Particulates* (TSP)

2.2 *Particulates* (TSP)

2.2.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. Number of daily observations.

2.2.2 *Annual Summary Statistics.* Annual geometric mean ($\mu g/m^3$). Highest and second highest daily values and dates of occurrence. Number of exceedances of the 24-hour primary NAAQS. Number of exceedances of the 24-hour secondary NAAQS. Number of 24-hour average concentrations in ranges:

Range:	Number of values
0 to 65 ($\mu g/m^3$)	
66 to 130	
131 to 195	
196 to 260	
261 to 325	
326 to 390	
391 to 455	
Greater than 455	

2.3 *Carbon Monoxide* (CO)

2.3.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations.

2.3.2 *Annual Summary Statistics.* Highest and second highest 1-hour values (ppm) and date and time of occurrence. Highest and second highest 8-hour averages (*3*) (ppm) and date and time of occurrence (ending hour). Number of exceedances of the 1-hour primary NAAQS. Number of exceedances of the 8-hour average primary NAAQS. (*3*) Number of 8-hour average concentrations (*4*) in ranges:

Range:	Number of values
0 to 4 (ppm)	
5 to 8 (ppm)	
9 to 12	
13 to 16	
17 to 20	
21 to 24	
25 to 28	
Greater than 28	

2.4 *Nitrogen Dioxide* (NO_2)

2.4.1 *Site and Monitoring Information.* City name (when applicable), county name, and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations. (*1*) Number of daily observations. (*2*)

2.4.2 *Annual Summary Statistics.* Annual arithmetic mean (ppm). Highest and second highest hourly averages (*3*) (ppm) and their dates and time of occurrence. Highest and second highest 24-hour averages (*2*) and their date of occurrence (ppm). Number of hourly average concentrations in ranges. (*1*)

Range:	Number of values
.0 to .04 (ppm)	
.05 to .08	
.09 to .12	
.13 to .16	
.17 to .20	
.21 to .24	
.25 to .28	
Greater than 0.28	

2.5 *Ozone* (O_3)

2.5.1 *Site and Monitoring Information.* City name (when applicable), county name and street address of site location. SAROAD site code. SAROAD monitoring method code. Number of hourly observations.

2.5.2 *Annual Summary Statistics.* Four highest daily maximum hour values (ppm) and their dates and time of occurrence. Number of exceedances of the daily maximum 1-hour primary NAAQS. Number of daily maximum hour concentrations in ranges:

Range:	Number of values
0 to .04 (ppm)	
.05 to .08	
.09 to .12	
.13 to .16	
.17 to .20	
.21 to .24	
.25 to .28	
Greater than .28	

Footnotes

1. Continuous methods only.
2. Manual or intermittent methods only.
3. Based on nonoverlapping values computed according to procedures described in reference (1) or on individual intermittent measurements.
4. Based on overlapping running averages for continuous measurements as described in reference (1) or on individual measurement for intermittent methods.

REFERENCE

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Appendix G—Uniform Air Quality Index and Daily Reporting

1. General.
2. Definitions.
3. Monitoring data.
4. Geographic applicability.
5. Daily index report.
6. Prominent public notice.
7. Uniform air quality index.
7.1 Uniform index computation.
7.2 Example computation.
8. Exceptions.
9. Reporting agency recordkeeping.
10. Basis for PSI.
11. Additional information.
12. References.

1. General

This appendix describes the uniform air quality index to be used by States in reporting the daily air quality index required by § 58.40.

2. Definitions

a. The uniform air quality required for the daily reporting of air quality is a modified form of the Pollutant Standards Index (PSI).

b. "Reporting agency" means the applicable State agency or, in metropolitan areas, a local air pollution control agency designated by the State to carry out the provisions of § 58.40.

c. "Reporting area" means the geographical area for which the daily index is representative for the reporting period. This area(s) may be the total urban area (or subpart thereof) or each of any number of distinct geographical subregions of the urban area deemed necessary by the reporting agency for adequate presentation of local air quality conditions.

d. "Reporting day" means the calendar day during which the daily report is given.

e. "Reporting period" means the time interval for which the daily report is representative. Normally, the reporting period is the 24-hour period immediately preceding the time of the report and should coincide to the extent practicable with the reporting day. In cases where the index will be forecasted the reporting period will include portions of the reporting day for which no monitoring data are available at the time of the report.

f. "Critical pollutant" means the pollutant or pollutant combination (TSP x SO_2) with the highest subindex during the reporting period.

g. "Subindex" means the calculated index value for a single pollutant as described in section 7.

3. Monitoring Data

The monitoring data used to prepare the daily index report must be based on data obtained from the SLAMS network (or portions thereof) required under 40 CFR 58.20. Air quality measurements need not be made on reporting days for which the agency does not ordinarily schedule monitoring to occur. For example, TSP measurements are to be included in the index calculations on days for which data are required (minimum of one sample per 6 days), but may be excluded on other days. Particulate measurements from samplers other than the hi-volume sampler, may be included in index calculations provided such measurements can be quantitatively related to hi-volume measurements.

Data used to calculate the daily index (and respective subindices) should come from the most recent sampling period. The index should be based on data obtained during the 24-hour period for which the index is reported. No monitoring data are to be used for index calculations for which the end of the sampling period precedes the reporting day by more than 24-hours. To the extent practicable, agencies should forecast the index using whatever procedures are most accurate and reasonable through consideration of local meteorological and topographical conditions and the availability of data and forecasting expertise.

4. Geographic Applicability

Generally, the area contained within the geographic boundaries of the urban area is sufficient for purposes of calculating and reporting the index. The exception occurs in cases where a significant air quality problem exists (PSI greater than 100) in highly populated areas adjacent to, but outside of, the urban area. For example, ozone concentrations are often highest downwind and outside the urban area.

Agencies should report a separate air quality index for each subregion of the urban area which is likely to have air quality significantly different from other portions of the urban area if such data are readily available. At a minimum, the subregion subject to the highest index values shall be included in the index computation. This

subregion shall be selected by the reporting agency after past air quality has been reviewed to determine which monitoring stations typically record the highest pollutant concentrations.

5. Daily Index Report

The daily index report must be based on the uniform air quality index described in section 7 and contain the following information: (1) The reporting area(s); (2) the reporting period; (3) the critical pollutant; (4) the subindex corresponding to the critical pollutant; and (5) the descriptor word according to the following system:

Index Range and Descriptor Category

0 to 50.....“Good”
51 to 100.....“Moderate”
101 to 199.....“Unhealthful”
200 to 299.....“Very Unhealthful”
300 and above.....“Hazardous”

Reporting agencies should, at their discretion, report additional information such as the following: (1) Pollutants other than the critical pollutants and their individual subindices; (2) subindices and respective pollutant names for each of a number of distinct reporting areas within the urban area; (3) actual pollutant concentration values; and (4) causes for unusual PSI readings, such as high background air quality levels and other natural phenomena.

6. Prominent Public Notice

The reporting agency shall make prominent public notice of the daily index report on at least 5 days per week. Prominent public notification consists of at a minimum: (1) furnishing the daily report to one or more of the appropriate news media (radio, television, newspapers); and (2) making the daily index report publicly available at one or more places of public access. Index reports also may be disseminated by means of recorded messages.

7. Uniform Air Quality Index

The uniform index is based on the pollutants standards index (PSI) structure (see section 10), which includes the five pollutants for which primary National Ambient Air Quality Standards (NAAQS) have been established. These pollutants are: total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and nitrogen dioxide (NO_2). For each pollutant, a subindex is calculated from a segmented linear function that transforms ambient concentrations onto a scale extending from 0 through 500, with 100 corresponding to the primary NAAQS concentrations and 500 corresponding to the significant harm levels established in § 51.16 of this chapter. In order to achieve relative uniformity for intermediate PSI values of 200, 300, and 400 among the several pollutants, their effects were approximately normalized by using the breakpoints corresponding to the Alert, Warning and Emergency levels in the example episode criteria. (1) However, because many factors, including meteorological conditions, are taken into account before triggering episode control actions, the reported PSI values and the calling of an episode do not always correspond. It should be recognized that over time with new information on effects, the actual concentrations corresponding to the PSI values may change. The PSI values themselves and their health implications, however, should remain the same. Similarly, concentrations and conditions leading to administrative episode actions may change.

In addition to the five health-related pollutants, a subindex is calculated for the product TSP x SO_2 because it has both Federal episode criteria and a significant harm level. The breakpoint used in defining each of the six pollutant subindices are listed in gravimetric units (Table 1) and in volumetric units (Table 2). The individual computational scheme is defined below for calculating the pollutant subindex values.

7.1 Uniform Index Computation

Each subindex i, is calculated by using a segmented linear function (Figures 1–6) that relates pollutant concentration, X_i, to subindex value, I_i. A segmented linear function consists of straight-line segments joining discrete coordinates (i.e., breakpoints). For pollutant i and segment j, the coordinates of the jth breakpoint are represented by subindex value $I_{i,j}$ and concentration $X_{i,j}$ giving the ordered pair $(X_{i,j}, I_{i,j})$. If the observed concentration is X_i, the corresponding subindex value I_i is calculated using the following equation over the concentration range:

$$X_{i,j} \leq X_i \leq X_{i,j+1}:$$

$$I_i = \frac{I_{i,j+1} - I_{i,j}}{X_{i,j+1} - X_{i,j}} (X_i - X_{i,j}) + I_{i,j} \qquad (1)$$

$$\text{for } X_{i,j} \leq X_i \leq X_{i,j+1}$$

where X_i = observed concentration for ith pollutant
$I_{i,j}$ = PSI value for ith pollutant and jth breakpoint (Table 1 or 2)
$I_{i,j+1}$ = PSI value for ith pollutant and (j + 1)th breakpoint (Table 1 or 2)
$X_{i,j}$ = concentration for ith pollutant and jth breakpoint (Table 1 or 2)
$X_{i,j+1}$ = concentration for ith pollutant and (j + 1)th breakpoint (Table 1 or 2)

Finally, the overall index is calculated as the maximum of subindices:

$$PSI = \max (I_1, I_2, \ldots, I_i, \ldots, I_n)$$

where
I_i = subindex for ith pollutant
n = number of pollutants (including pollutant combinations)

7.2 Example Computation

Suppose a TSP 24-hour concentration of 283 $\mu g/m^3$ is observed. The TSP subindex is calculated using equation 1 as follows. In Table 1, the observed concentration of $X_i = 283\ \mu g/m^3$ lies between 260 and 375 $\mu g/m^3$, therefore this computation is carried out for the second segment (j=2). For this segment, $X_{1,2}=260$ and $X_{1,3}=375$, with corresponding subindex values for $I_{1,2}=100$ and $I_{1,3}=200$. The computation is as follows:

$$I_T = \frac{I_{1,3} - I_{1,2}}{X_{1,3} - X_{1,2}} (283 - X_{1,2}) + I_1 =$$

$$\frac{200 - 100}{375 - 260} (283 - 260) + 100 = \frac{100}{115} \times 23 + 100 = 120$$

Therefore, the TSP subindex is I=120. If four other pollutant subindices calculated in a similar manner from observations on the same data were: $I_2=0$, $I_3=0$, $I_4=20$, and $I_5=30$. Then, the overall index is reported as the maximum of these values:

PSI=max (120, 0, 0, 20, 30)=120Q02

A typical report might contain the following statement: “Today’s air quality index is 120 which is regarded as unhealthful. The responsible pollutant is suspended particulate matter. This report represents conditions prevailing over most of the downtown urban area for the previous 24-hour period ending at noon today.” If the index were forecast for the next day, the following additional language might also be used: “The current forecast is for improved air quality tomorrow with the index not expected to exceed 90.”

8. Exceptions

In many urban areas, a given air pollutant may exhibit low concentrations repetitively. At the discretion of the reporting agency, pollutants for which PSI values are consistently below 50 for an extended period (for example, a season or year) may be excluded in calculations of the daily index.

Because the index is for the purpose of achieving national uniformity of daily air quality reports, the following variations are not permitted unless approved by the EPA Administrator:

a. Exlusion of pollutants described in section 7 from index calculations except as permitted above.

b. Incorporation of pollutants and/or pollutant combinations into the index not described in section 7.

c. Use of breakpoints other than those given in Table 1 or 2.

d. Use of descriptor words other than those given in section 5.

9. Reporting Agency Recordkeeping

The reporting agency shall keep annual records of the frequency with which reporting index values occur in each of the index descriptor categories. These records must also indicate the pollutant monitors in the SLAMS network being used for purposes of calculating the index for each reporting area. Such records must be made available for inspection at the request of the Administrator.

10. Basis for PSI

The development and evaluation of the PSI index structure have been documented extensively. (2–12) The index was created as a result of a joint EPA/CEQ study (2) which identified problems resulting from the diversity of indices used in the United States and Canada. This report proposed design principles that could be used to develop a nationally uniform index to meet the needs of State and local agencies. The design principles on which PSI is based, along with previous versions of the index, have been presented in various scientific reports, (3, 4) articles in technical journals, (4, 5, 11) and at various scientific meetings and conferences. (7–10) Most recently, the history of the development of PSI along with its scientific rationale, has been summarized in a book. (6) In September 1976, PSI was published in the Federal Register (13) for use by State and local air pollution control agencies on a voluntary basis.

11. Additional Information

A variety of computational techniques have been developed to assist the user in calculating PSI in an accurate, convenient and rapid manner. (6) The primary techniques available are graphs (linear and logarithmic), nomograms, tables, and computer approaches. An EPA report (14) describes each technique, lists its advantages and disadvantages, includes examples of the methods, and provides nomograms and tables in both gravimetric and volumetric units. The nomograms are considered to be the most efficient way of competing the index and should be of greatest assistance to State and local agencies. Computer approaches for calculating PSI also are available. (15) These approaches lend themselves to applications with programmable hand calculators, mini-computers, or large-scale digital computers. A general computer program, Index Plot, used in an earlier evaluation of PSI, (11) is available from EPA and is fully documented. (15) This computer program is useful for analyzing air quality data by means of PSI over relatively long periods (a month, a season, or a year). It plots the time series of daily index values on the line printer, generates and plots a histogram and cumulative frequencies of PSI values, computes summary data by subindex and descriptor category, computes overall statistics for PSI, and inventories all missing values in the data set. Agencies can use this program to translate all historical data collected at any station into the corresponding PSI values, and, thus, retain for recordkeeping purposes a uniform retrospective record of air quality. (11, 15) Requests for these reports should be addressed to the Environmental Protection Agency, Library, MD–35, Research Triangle Park, N.C. 27711.

Additional information on descriptive language to report with the index is provided in an earlier report (1) and in the air quality criteria documents published for each air pollutant. (16–20) Additional information on meteorological forecasting services from the National Weather Service also is available in the literature. (21, 22)

Additional information on the health effects of each air pollutant used in PSI is available in a brochure entitled, "Measuring Air Quality: The New Pollutant Standards Index," Printing Management Office (PM–215), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460.

12. References

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Table 1.—*Breakpoints for PSI in Metric Units*[a]

PSI value (ψ)	24-hr. TSP μg/m³	24-hr. SO_2 μg/m³	TSP×SO_2 (μg/m³)²	8-hr. CO μmg/m³	1-hr. O_3 μg/m³	1-hr. NO_2 μg/m³
50	75	80	(*)	5	18	(*)
100	260	365	(*)	10	235	(*)
200	375	800	65×10^3	17	400	1,130
300	625	1,600	261×10^3	34	800	2,260
400	875	2,100	393×10^3	46	1,000	3,000
500	1,000	2,620	490×10^3	57.5	1,200	3,750

[a]At 25°C and 760 mm Hg.
[b]No index value reported at these concentration levels because there is no short-term NAAQS.

Table 2.—*Breakpoints for PSI*

[Parts per million]

PSI value (ψ)	24-hr. SO_2	TSP×SO_2 (μg/m³×ppm)	8-hr. CO	1-hr. O_3	1-hr. NO_2
50	0.03	(*)	4.5	.06	(*)
100	0.14	(*)	9	.12	(*)
200	0.30	24.82	15	0.2	0.6
300	0.60	99.66	30	0.4	1.2
400	0.80	150.1	40	0.5	1.6
500	1.00	187.1	50	0.6	2.0

[a]No index value reported at these concentration levels because there is no short-term NAAQS.

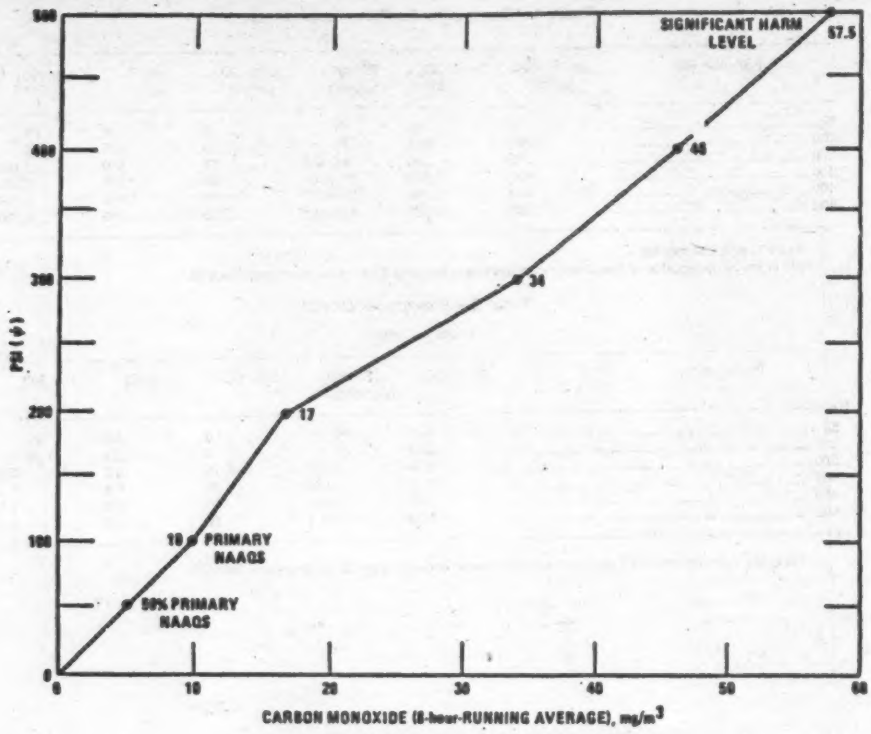

Figure 1. PSI function for carbon monoxide.

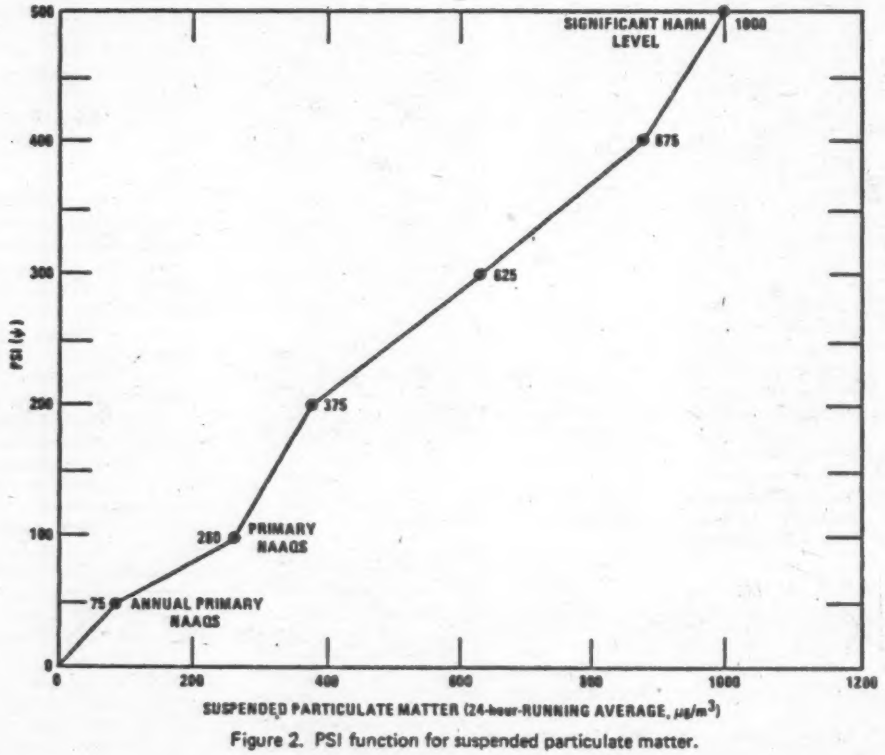

Figure 2. PSI function for suspended particulate matter.

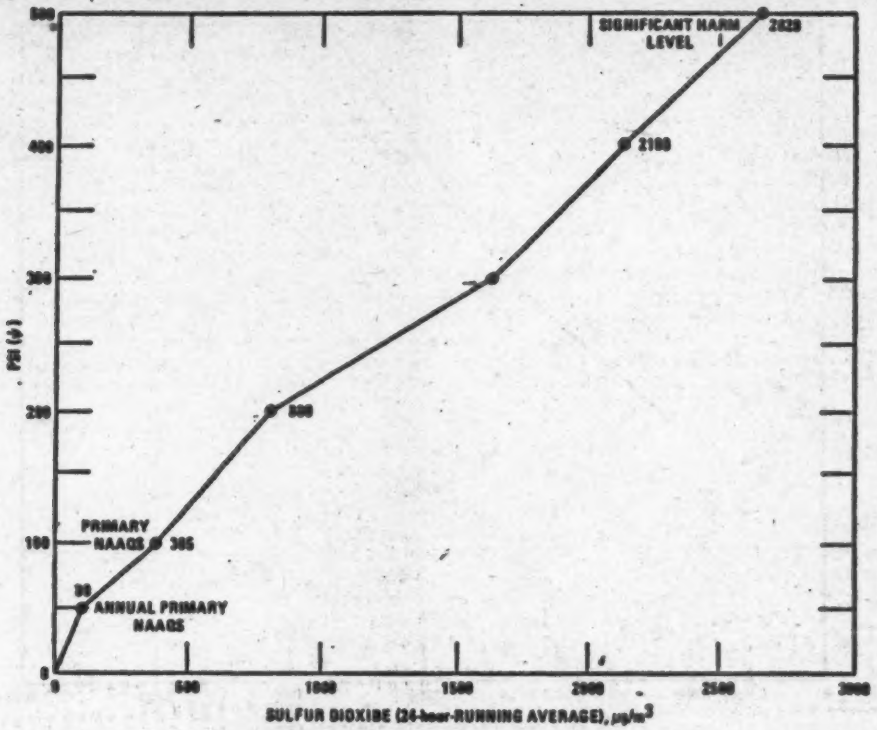

Figure 3. PSI function for sulfur dioxide.

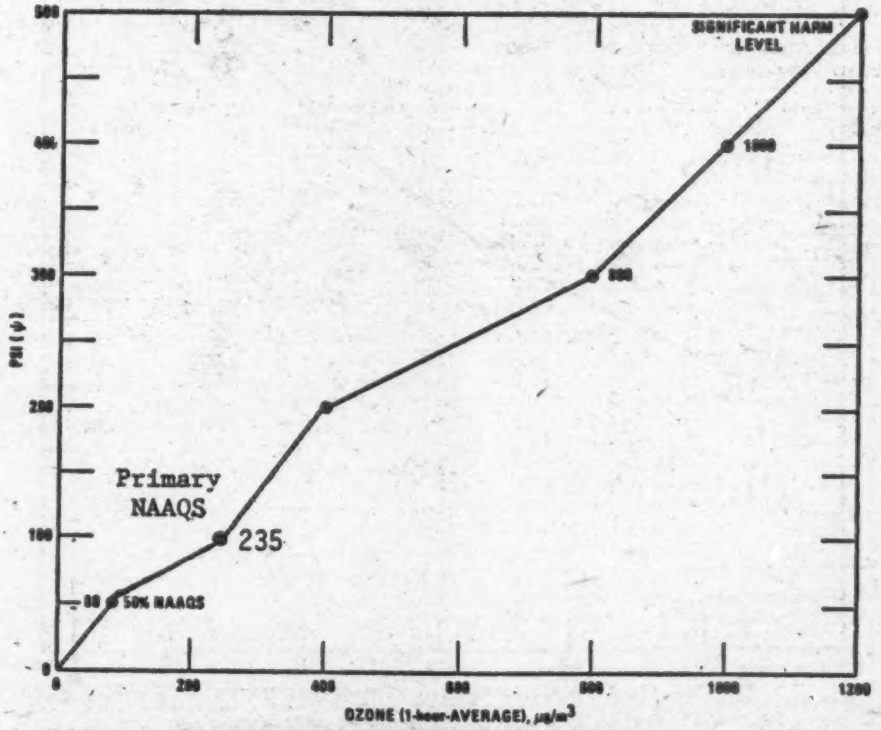

Figure 4. PSI function for photochemical oxidants.

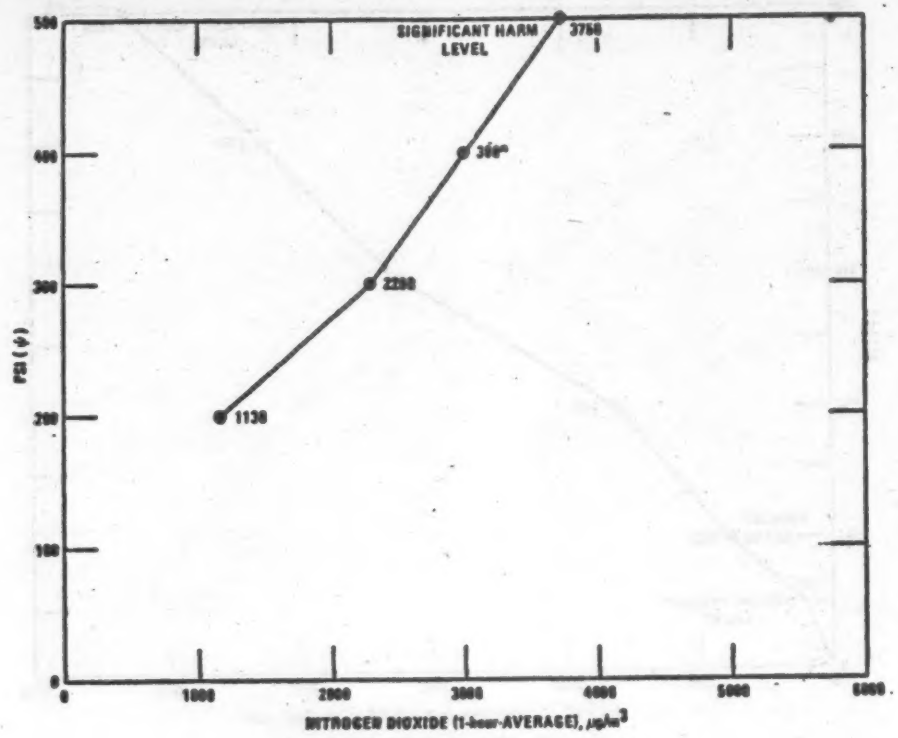

Figure 5. PSI function for nitrogen dioxide.

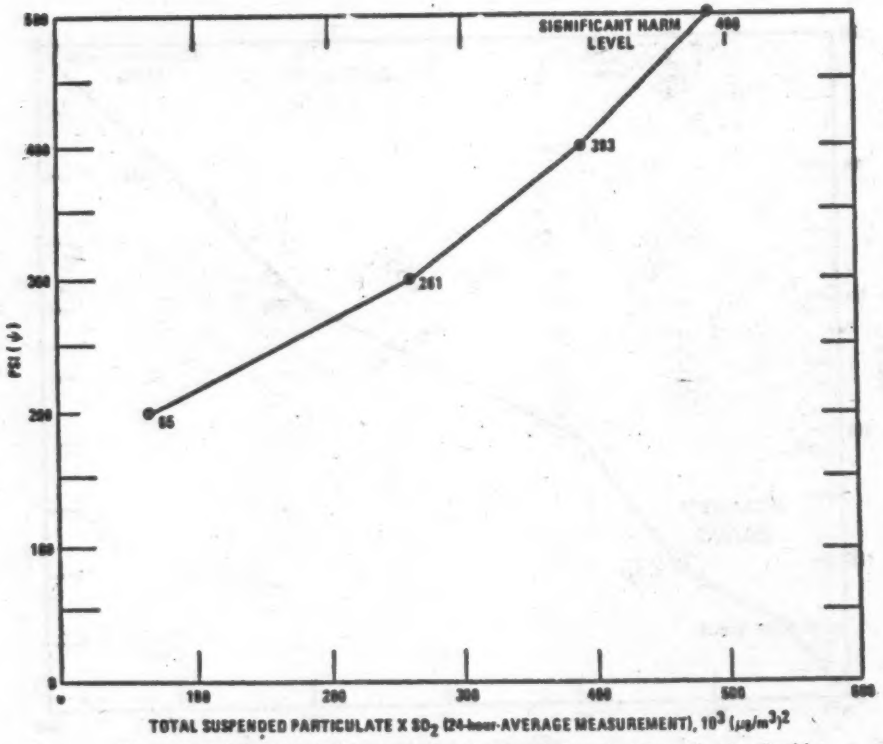

Figure 6. PSI function for product of total suspended particulate and sulfur dioxide.

[FRL 1089-3]

[FR Doc. 79-14488 Filed 5-9-79; 8:45 am]

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